Regional Information Report No. 4K07-8

Project Operational Plan for the 2007 St. Matthew Island Blue King Crab Survey

by

Leslie J. Watson

July 2007

Alaska Department of Fish and Game **Division of Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Measures (fisheries)

fork length	FL
mideye-to-fork	MEF
mideye-to-tail-fork	METF
standard length	SL
total length	TL

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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ABSTRACT

This report describes the project operational plan for the 2007 St. Matthew Island blue king crab *Paralithodes platypus* triennial survey. A description of the objectives, survey area, sampling methodologies, data analysis, and reporting is given. The survey will be conducted by Alaska Department of Fish and Game (ADF&G) biologists aboard the chartered 39.6-m (130-ft) vessel, FV *Sultan* during July-August 2007 in the St. Matthew Island Section of the Bering Sea (Area Q). One-hundred and forty-one primary stations and up to 24 secondary stations near St. Matthew, Hall, and Pinnacle Islands will be sampled using a series of four-pot stations during the 30-day survey. A relative stock abundance index from the surveyed area will be obtained and compared to indexes from triennial surveys conducted by ADF&G in 1995, 1998, 2001, and 2004. Bottom water temperature profiles will be collected across the depth range of fished pots. Benthic habitat data obtained using a seabed classification system will be collected continuously for the duration of the survey.

Key words: blue king crab, *Paralithodes platypus*, St. Matthew Island, Bering Sea, pot survey, distribution, relative abundance, ocean bottom temperature, benthic habitat.

INTRODUCTION

The St. Matthew Island Section for blue king crabs *Paralithodes platypus* is within the Northern District of the Bering Sea king crab registration area (Area Q) and includes the waters north of the latitude of Cape Newenham (58°39' N. lat.) and south of the latitude of Cape Romanzof (61°49' N. lat.) (Bowers et al. 2005). Commercial fisheries for blue king crabs in the St. Matthew Island Section occurred from the 1977 through the 1998 seasons, with a peak harvest of 9.5 million pounds landed in the 1983 season. The St. Matthew Island blue king crab fishery was declared overfished in 1999 due to an estimated stock size lower than the minimum stock size threshold specified in the federal Fishery Management Plan for the Bering Sea/Aleutian Islands King and Tanner Crab (NPFMC 1998). The fishery has remained closed from the 1999 through the 2006 seasons because stock levels have been below the threshold specified in the harvest strategy or have been too low to provide the minimum harvest level of 2.5 million pounds (ADF&G 2006). Results from the 2006 eastern Bering Sea (EBS) trawl survey indicated that the abundance of legal and sublegal male blue king crabs had increased from a total of 1.8 million crabs in 2005 to 4.2 million crabs in 2006, the highest value since the fishery was closed after the 1998 season (Rugulo et al. 2006). However, female abundance has remained low, at an estimated 0.4 million crabs in 2006.

The St. Matthew Island blue king crab stock is inadequately surveyed by the annual National Marine Fisheries Service (NMFS) eastern Bering Sea (EBS) trawl survey due to the rocky bottom conditions that exist where legal male and mature female crabs are at highest densities. As a result, abundance estimates of legal males from the trawl survey can be unreliable and virtually no information on mature females is provided by the trawl survey. To address these problems, the Alaska Department of Fish and Game (ADF&G) instituted a triennial pot survey program for St. Matthew Island blue king crabs in 1995, 1998, 2001, and 2004 (Blau 1996, Blau and Watson 1999, Watson and Burt 2002, Watson 2005) to augment the NMFS EBS trawl survey and performed a special nearshore pot survey for females in cooperation with NMFS in 1999 (Blau 2000). Results of the ADF&G pot surveys have been crucial to understanding the stock distribution relative to fishery effort, fishery performance, and coverage by the NMFS trawl survey. In 1995, a standard survey grid composed of 188 stations located between 59°30' and 60°48' N latitude and 172°00' and 174°00' W longitude (Figure 1) was established based on the historic concentration of fishing effort, geographic distribution, and density of blue king crabs observed in annual NMFS EBS trawl survey catches (Watson et al. 1995). The standard survey grid was expanded in 2004 to include 12 additional stations, 10 of which are located in the shallow waters (11 fm to 20 fm) adjacent to the southern shore of St. Matthew Island that are known to be inhabited by females (Watson 2004).

TERMS

Blue King Crabs

- Legal males: ≥ 140-mm (5.5-in) carapace width (CW) outside lateral spines.
    - Legal male recruits: new-shell crabs <134-mm carapace length (CL).
    - Legal male postrecruits: new-shell crabs ≥ 134-mm CL and/or all old- or very old-shell crabs of legal size.
- Sublegal males: <140-mm (5.5-in) CW outside lateral spines.
    - Sublegal prerecruit males: ≤ 105-mm CL.
    - Sublegal prerecruit one males: ≥ 105-mm CL.
- Females: Mature - presence of eggs or empty egg cases on the pleopodal setae or by the matted condition of the setae. Immature - no eggs or empty egg cases on the pleopodal setae; pleopodal setae are clean.

Snow Crabs

- Legal males: ≥ 79-mm (3.1-in) CW outside lateral spines.
- Sublegal males: < 79-mm (3.1-in) CW outside lateral spines.
- Females: Immature and mature as identified by the shape of the abdominal flap (Jadamec et al. 1999).

Tanner Crabs

- Legal males: ≥ 140-mm (5.5-in) CW outside lateral spines.
- Sublegal males: < 140-mm (5.5-in) CW outside lateral spines.
- Females: Immature and mature as identified by the shape of the abdominal flap (Jadamec et al. 1999).

Hair Crabs

- Legal males: ≥ 83-mm (3.25-in) CW outside lateral spines.
- Sublegal males: <83-mm (3.25-in) CW outside lateral spines.
- Females: Mature - presence of eggs or empty egg cases on the pleopodal setae or by the matted condition of the setae. Immature - no eggs or empty egg cases on the pleopodal setae; pleopodal setae are clean.

METHODS

The pot survey will be conducted aboard the FV *Sultan*, a 130-ft (39.6 m) commercial crab-pot-fishing vessel from approximately July 23 to August 21, 2007. The 30-day charter will begin and end in Dutch Harbor with a captain, engineer, three crewmen, and four ADF&G biologists aboard. Details on methods are provided in the Shipboard Instructions (Appendix A). Approximately two of the 30 days allotted will be necessary for vessel travel to and from the survey grounds (Appendix B1).

Overall methodology follows that described in the 1995, 1998, 2001, and 2004 survey operational plans (Watson et al. 1995, Blau and Watson 1998, Watson and Pengilly 2001, and

The ADF&G pot survey provides information from commercially and biologically important areas that are not surveyed by the annual NMFS trawl survey, and the closer spacing of survey stations for the ADF&G pot survey relative to the NMFS trawl survey allows for detecting changes in spatial processes that accompany changes in stock status (Vining et al. 2001). Moreover, in 2001, the pot survey provided important information on the mature female component of the stock relative to the overfished status that could not be provided by the NMFS EBS trawl survey alone (Watson and Burt 2002, Watson 2005) and on changes in the distribution and density of snow crabs in the vicinity of St. Matthew Island (Watson 2005). Changes in the relative abundance of blue king crabs from triennial pot surveys showed that legal male crab remained fairly high in the first three surveys and had declined five-fold in the 2004 survey (Table 1). Sublegal male crabs were relatively abundant in the first two surveys but declined by 50% in 2001; by 2004 sublegal males were just 20% of the 2001 catch. As with sublegal males, female blue king crabs were also relatively abundant in the first two surveys, but declines in the next two surveys were much greater. In 2001, female crab numbers had dropped by 80%; by 2004, female crab abundance was 30% of the 2001 catch.

Analysis of tagged legal male blue king crab survey releases and recoveries in the 1995 and 1998 St. Matthew Island commercial fisheries has provided information relating to differential recovery rates of tagged crabs between discrete areas within the survey area (Pengilly and Watson 2004). During the 1995 fishery, legal males tagged and released in Stratum 2 (Figure 2) were recovered at over 8 times the rate of those tagged and released in Stratum 1. In the 1998 commercial fishery, tag recovery rates were also dependent upon stratum of release; the recovery rate for legal males tagged in Stratum 2 was 2.7 times higher than for those tagged in Stratum 1.

Performance of the 2007 triennial St. Matthew Island blue king crab pot survey is necessary for assessing the stock condition relative to rebuilding from an overfished condition and to sustain the time series of data that is needed for incorporation into a multiple-year stock assessment model for this stock (e.g., Vining and Zheng 2006). An important new component of the 2007 triennial St. Matthew Island blue king crab survey is the collection of benthic habitat data within the survey area using a seabed classification system. This operational plan describes the methodology for conducting the 2007 triennial blue king crab survey near St. Matthew Island.

OBJECTIVES

Prioritized objectives for the 2007 St. Matthew Island blue king crab survey are as follows:

1. Obtain a relative stock abundance index (pot survey catch per unit effort) of male and female blue king crabs in the waters south of St. Matthew Island during the summer of 2007.

2. Describe a portion of the blue king crab population residing in shallow waters from 11-fm to 20-fm (20-m to 37-m) relative to sex, size, and reproductive characteristics.

3. Characterize the benthic habitat in the survey area using a seabed classification system and obtain bottom ocean temperature profiles across the depth ranges fished during the survey.

4. Describe the overall species composition in the survey area, with emphasis on snow crabs *Chionoecetes opilio* distribution and relative abundance by sex and size.

Watson 2004) and documented in respective survey reports (Blau 1996, Blau and Watson 1999, Watson and Burt 2002, and Watson 2005).

SURVEY DESIGN

The 2007 survey station grid encompasses the area between 59°30' and 60°30' N latitude and 172°00' and 174°00' W longitude and is composed of 141 primary and 24 secondary stations (Figure 2).

Standard Offshore Area

Two geographic strata with different densities of survey stations are defined: a double-station density directly south of St. Matthew Island (Stratum 2) and a single-station density (Stratum 1) southward and offshore of Stratum 2 (Figure 2). Station layout in Stratum 2 is based on a grid in which stations are spaced 5 nmi north-to-south and east-to-west and overlaid with another 5-nmi by 5-nmi grid offset by 2.5 nmi north-to-south and east-to-west. Stratum 2 has historically produced the highest catches of mature females and legal males and contains the areas of highest fishery effort in historic fisheries. Station layout in Stratum 1 is based on a single 5-nmi by 5-nmi grid. Each station in Stratums 1 and 2 will be sampled using four rectangular king crab pots set 0.125 nmi apart and arrayed either north-to-south or east-to-west, depending on prevailing wind and tide conditions.

Shallow-Waters Area

Prior to the shallow-water surveys conducted by ADF&G in August 1998 and 1999, the NMFS trawl survey and the ADF&G pot survey did not sample the shallow-water (≤ 20 fm) habitat in the St. Matthew Island area, resulting in the inadequate assessment of ovigerous female crabs that were believed to reside in the shallows. The presence of large numbers of ovigerous females in shallow waters was confirmed in the ADF&G 1998 and 1999 surveys: ovigerous females comprised nearly 82% of the 3,011 captured females (Watson 2004). In the standard pot surveys in 1995, 1998, and 2001, ovigerous females averaged just 3% of the total catch. Because so few ovigerous females are captured in standard pot and trawl surveys, reproductive characteristics of that group are not adequately sampled and temporal trends in the abundance of reproductive females were not monitored within the triennial survey plan. For that reason, a series of 10 shallow-water stations were identified near the south shore of St. Matthew Island for sampling in the 2004 survey (Figure 3). Each station in the shallow-waters Stratum 3 are arrayed 2 nmi from adjacent stations and each station consists of four king crab pots set in a line perpendicular to shore and spaced at 3-fm intervals to sample the 11-fm to 20-fm depth range.

Ninety identical king crab pots measuring 7-ft x 7-ft x 34-in supplied by ADF&G will be used and are identical to those used in the 1998, 2001, and 2004 St. Matthew Island surveys. Each pot is webbed with #92 nylon twine with a stretch mesh of 2¾ in and has two opposing 8-in by 36-in tunnel eye openings. Each pot will be baited with one gallon of frozen chopped Pacific herring *Clupea pallasi*. The target soak time for each pot is 30 to 36 hours and pots will be retrieved in the sequential order that they are set.

A minimum of 141 stations (stations 1-121, 146-152, 201-203, and 301-310) will be fished. If weather and other survey conditions allow, up to 24 additional stations (122-145) will also be fished. One 'block' of 6 - 8 stations will be set and pulled each day as outlined in Appendix B2; mid-point station coordinates are listed in Appendix B3. If all designated survey stations are sampled, additional stations will be selected from adjacent areas using coordinates from the established 200-station survey grid (Appendix B4).

Fishing parameters such as station and sequential pot number, set date and time, lift date and time, bottom type (rock, sand, silt, mud or gravel), latitude and longitude, and gear performance will be reported on the Survey Pilot House Log (Appendix C1).

CATCH SAMPLING

The contents of each pot fished will be enumerated to provide catch per unit effort data for blue king crabs, snow crabs *Chionoecetes opilio*, Tanner crabs *C. bairdi*, and hair crabs *Erimacrus isenbeckii*. A determination of legal-sized versus sublegal-sized males, shell condition of males and females, and female reproductive status will be assessed for each species. Carapace length (CL) of king crabs will be measured from the posterior margin of the right eye orbit to the midpoint of the rear margin of the carapace (Wallace et al. 1949) as illustrated in Donaldson and Byersdorfer (2005). Carapace width (CW) of Tanner crabs will be measured across the carapace at the widest part perpendicular to the medial line, with the tips of the calipers reaching inside the lateral spines as in Jadamec et al. 1999.

Carapace length, legal size status, female maturity, shell condition, and female reproductive data will be recorded on the Crab Measurement Form (Appendix C2). Blue king crab catches will be tallied daily by sex and size class as described under Terms (i.e, legal male recruits and postrecruit, sublegal males <105-mm CL, sublegal male prerecruits ≥105-mm CL, and females) and recorded on the Station Catch Summary Form (Appendix C3). Snow crab catches will also be tallied daily by sex and size class as described under Terms (i.e., legal males ≥79-mm CW to 101-mm CW, legal males ≥102 mm CW, sublegal males, and females) and recorded on the Station Catch Summary Form (Appendix C3). An explanation of crab codes used in completing all survey forms is given in Appendix D.

Subsamples of male and female snow crabs for length distribution, shell condition, and female reproductive data may be taken when successive pots within a station contain a large number of crabs. Subsampling of large pot catches may only be done when sampling the full pot contents would either impact crab vitality on deck or the vitality of crabs in subsequent pots in the water, or unnecessarily delay overall survey progress. A minimum of 100 males and 100 females will be measured in each pot and the total count by sex and size category will be recorded on the Crab Subsampling Form (Appendix C4). The subsample will be randomly taken before non-measured crabs are counted and released.

All other captured invertebrates and fishes will be identified to species, if possible, and recorded on the Species Composition Form (Appendix C5). Commercially important species such as Pacific cod *Gadus macrocephalus*, walleye pollock *Theragra chalcogramma*, sablefish *Anoplopoma fimbria,* Pacific halibut *Hippoglossus stenolepis*, Greenland turbot *Reinhardtius hippoglossoides*, yellowfin sole *Limanda aspera*, northern rock sole *Lepidopsetta polyxystra*, and flathead sole *Hippoglossoides elassodon*, will be measured and lengths recorded on the Fish Length Form (Appendix C6).

OCEAN BOTTOM TEMPERATURE DATA COLLECTION

Bottom temperature (ºC) and depth profiles will be obtained during the survey by placing a temperature data logger in a single pot at each 4-pot station fished. Five Brancker® model TDR-2050/2051 data loggers that record temperature and depth will be deployed along with five Brancker® model XR-420-CTD data loggers that record conductivity (salinity), temperature, and depth. Temperature-depth profiles collected in the 2007 survey will be compared with those obtained during previous triennial surveys to describe changes, if any, in bottom temperature

profiles by depth and station. Data loggers will be externally marked with a deck identification number (Appendix C7) that will be recorded on the Survey Pilot House Log at the time of deployment.

BENTHIC HABITAT DATA COLLECTION

The distribution and relative abundance of blue king crabs in the survey area will be compared with benthic habitat data collected during the survey.

Habitat Mapping

Data on benthic habitat types or seabed classification within the survey area will be obtained during the charter using QTC VIEW[1] methodology (Gish 2007, Quester Tangent Corporation 2004a). It will consist of acquiring data from the ship's echo sounder, in particular, the first return ping or waveform. Waveforms vary according to the characteristic texture of the surficial seafloor sediment-the frequency distribution of grain sizes, or the immediate subsurface sediment. Waveforms are classified into groups according to different bottom types. Bottom type locations are correlated with a dedicated global positioning system, and color images of different bottom types are produced by applying QTC IMPACT software (Quester Tangent Corporation 2004b). Computer files created by QTC VIEW will be downloaded daily and documented on the QTC VIEW Form (Appendix C9).

Habitat sampling

A minimum of one benthic sediment sample will be obtained from each bottom type to provide data to ground-truth the echo sounder data returns. The sediment samples will be classified according to the percentage of mud, sand, and gravel contained in each sample according to Folk (1954). Samples will be collected using a Van Veen grab deployed at or near slack tide to ensure successful deployment and retrieval (Gish 2007). Each sample will be placed in a one-gallon zip-lock bag, labeled with the date, time, latitude and longitude, and stored in the ship's bait freezer. Each sample will be documented on the Benthic Sample Form (Appendix C10).

DATA ANALYSIS

Catch per unit effort (CPUE) of blue king crabs and snow crabs captured during the 2007 survey will be summarized by sex-size classes by individual station and for the overall survey area. Maps with graphic depictions of CPUE by station will be prepared to identify spatial trends in blue king crab and snow crab densities. Frequency distributions of size and shell condition will be summarized and graphed for males and females separately. Female blue king crab reproductive characteristics will be summarized. The 2007 survey data will be tabulated and compared with that of the previous triennial survey data to describe changes in relative abundance, spatial distribution, and relative size classes. Snow crab data will be analyzed as detailed above for blue king crabs. Length distributions for captured commercially-important fish species will be summarized and graphed.

Ocean bottom temperature and depth information will be tabulated and compared with temperature-depth profiles obtained in previous triennial surveys. Distribution and relative abundance of blue king crabs will be compared to benthic habitat data collected during the survey to determine if blue king and snow crab catches are correlated with bottom types.

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[1] Use of trade names does not constitute an endorsement by ADF&G.

SCHEDULES AND PERSONNEL

Date(s)	Activity	Personnel
12/2006-6/2007	Project planning, vessel charter procurement, operational plan and shipboard instructions	Watson and Burt
3/2007-6/2007	Purchase, prepare, and stage survey gear	Watson, Burt, Renfro, and Alinsunurin
7/2007-8/2007	Conduct at-sea survey	Watson, Byersdorfer, Renfro, and Soong
7/2007-9/2007	Edit and compile survey data	Watson and Burt
9/2007-10/2007	Enter survey data electronically	Chisum
10/2007-12/2007	Compile, analyze, and write final survey report	Watson and Burt

REPORTS

A post-survey memo will be written documenting the number of male and female blue king and snow crabs caught at each station during the survey. Complete documentation will also be made regarding vessel and at-sea crew performance, deviations in survey itinerary or sampling protocols, and any other items of importance that are not documented on survey forms.

A Fishery Management Report (FMR) detailing the results of the 2007 survey with comparisons to the 1995, 1998, 2001, and 2004 surveys will also be written.

Semi-annual progress reports and a final report will be written for associated NOAA grants relating to ADF&G Bering Sea/Aleutian Islands Crab Regional Research Program Support. The schedule for completion of all listed reports, including this Project Operational Plan, is given below.

Date	Report	Author(s)
6/30/2007	Project Operational Plan	Watson
9/01/2007	Post-survey memo	Watson
12/31/2007	FMR 2007 survey	Watson
7/31/2007	Semi-annual progress report (BSCR VI)	Pengilly and Watson
1/31/2008	Semi-annual progress report (BSCR VI)	Pengilly and Watson
7/31/2008	Semi-annual progress report (BSCR VI)	Pengilly and Watson
9/31/2008	Final project report (BSCR VI)	Pengilly and Watson

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REFERENCES CITED

ADF&G (Alaska Department of Fish and Game). 2006. 2006-2008 Commercial King and Tanner Crab Fishing Regulations. Alaska Department of Fish and Game, Juneau.

Blau, S.F. 1996. The 1995 St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K96-27, Kodiak.

Blau, S.F. 2000. Nearshore blue king crab survey – St. Matthew Island, 1999. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K96-27, Kodiak.

Blau, S.F., and L.J. Watson. 1998. Project operational plan: 1998 St. Matthew Island blue king crab project. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K98-49, Kodiak.

Blau, S.F., and L.J. Watson. 1999. St. Matthew Island blue king crab survey, 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K00-42, Kodiak.

Bowers, F.R., K.L. Bush, M. Schwenzfeier, J. Barnhart, M. Bon, M.E. Cavin, Jr., S. Coleman, B. Failor-Rounds, K. Milani, and M. Salmon. 2005. Annual management report for the commercial and subsistence shellfish fisheries of the Aleutian Islands, Bering Sea and the Westward Region's Shellfish Observer Program, 2004. Alaska Department of Fish and Game, Fishery Management Report No. 05-51, Anchorage.

Donaldson, W.E., and S.C. Byersdorfer. 2005. Biological field techniques for lithodid crabs. University of Alaska Sea Grant, AK-SG-05-03, Fairbanks.

Folk, R.L. 1954. The distinction between grain size and mineral composition in sedimentary rock nomenclature. J. Geol. 62: 344-359.

Gish, R.K. 2007. Project operational plan for the 2006 Petrel Bank red king crab survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Informational Report No. 4K07-1, Kodiak.

Jadamec, L.S., W.E. Donaldson, and P. Cullenberg. 1999. Biological field techniques for *Chionoecetes* crabs. University of Alaska Sea Grant, AK-SG-99-02, Fairbanks.

North Pacific Fishery Management Council (NPFMC). 1998. Fishery Management Plan for Bering Sea/Aleutian Islands King and Tanner Crabs. North Pacific Fishery Management Council, Anchorage.

Pengilly, D., and L.J. Watson. 2004. Recoveries of tagged blue king crabs *Paralithodes platypus* in St. Matthew Island commercial fisheries, 1995 – 1998. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-04-2, Kodiak.

Quester Tangent Corporation. 2004a. QTC VIEW Series IV: Operator's manual and reference. Report No. DMN-QAAS-R00. Sidney, B.C., Canada. 73 pp.

Quester Tangent Corporation. 2004b. QTC IMPACT: User manual and reference. Report No. DMN-MIMP-0001-RO3D. Sidney, B.C., Canada. 147 pp.

Rugulo, L.J., E.A. Chilton, C.E. Armistead, and J.A. Haaga. 2006. Report to industry on the 2006 Eastern Bering Sea crab survey. AFSC Processed Rep. 2006-17, 61 pp. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., Kodiak Fish. Res. Cent., 301 Research Court, Kodiak, AK 99615-7400.

Vining, I., S.F. Blau, and D. Pengilly. 2001. Evaluating changes in spatial distribution of blue king crab near St. Matthew Island. Pages 327-346 in G.H. Kruse, N. Bez, A. Booth, M.W. Dorn, R.N. Lipscius, D. Pelletier, C. Roy, S.J. Smith, and D. Witherell (eds.). Spatial processes and management of marine populations, University of Alaska Sea Grant College Program, AK-SG-01-02, Fairbanks.

Vining, I., and J. Zheng. 2006. Status of king crab stocks in the eastern Bering Sea in 2005. Alaska Department of Fish and Game, Fishery Management Report No. 06-29, Anchorage.

Wallace, M.M., C.J. Pertuit, and A.R. Hvatum. 1949. Contribution to the biology of the king crab (*Paralithodes camstchatica*) Tilesius. U.S. Department of the Interior, Fish and Wildlife Service, Fishery Leaflet No. 340.

Watson, L.J. 2004. Project operational plan for the 2004 triennial St. Matthew Island blue king crab survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-04-26, Kodiak.

Watson, L.J. 2005. The 2004 triennial St. Matthew Island blue king crab survey and comparisons to the 1995, 1998, and 2001 surveys. Alaska Department of Fish and Game, Divisions of Sport Fish and Commercial Fisheries, Fishery Management Report No. 05-22, Anchorage.

Watson, L.J., and R. Burt. 2002. The 2001 St. Matthew Island blue king crab survey and comparisons to the 1995 and 1998 surveys. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K02-37, Kodiak.

Watson, L.J., and D. Pengilly. 2001. Project operational plan for the 2001 St. Matthew Island blue king crab tagging survey. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 4K-01-41, Kodiak.

Watson, L.J., D. Pengilly, and S.C. Byersdorfer. 1995. Project operational plan for the 1995 St. Matthew Is. blue king crab tagging survey. Alaska Department of Fish and Game, Commercial Fisheries Management and Development Division, Regional Information Report No. 4K-95-48, Kodiak.

TABLES AND FIGURES

Table 1.-Summary of blue king crab catches from Stratums 1 and 2 during the 1995, 1998, 2001, and 2004 triennial St. Matthew Island pot surveys.

	Legal Males		Sublegal Males		Females	
Strata/Survey Year	Number	CPUE	Number	CPUE	Number	CPUE
Stratum 1 (65 stations, 250						
1995[a]	1,124	4.3	1,034	4.0	27	0.1
1998[b]	1,988	7.7	1,179	4.5	128	0.5
2001[c]	1,097	4.2	617	2.4	34	0.1
2004[d]	166	0.6	48	0.2	3	<0.1
Stratum 2 (31 stations, 124						
1995[a]	1,364	11.0	1,544	12.5	1,519	12.2
1998[b]	1,205	9.7	885	7.1	1,909	15.4
2001[c]	959	7.7	744	6.0	343	2.8
2004[d]	274	2.2	211	1.7	114	0.9
All Strata (96 stations, 384						
1995[a]	2,488	6.5	2,578	6.7	1,545	4.0
1998[b]	3,193	8.3	2,064	5.4	2,037	5.3
2001[c]	2,056	5.4	1,361	3.5	377	1.0
2004[d]	440	1.2	259	0.7	117	0.9

[a] 1995 survey data from Blau (1996) and the 'StMatt95' database as of October 31, 2004.

[b] 1998 survey data from Blau and Watson (1999) and the 'StMatt98' database as of October 31, 2004.

[c] 2001 survey data from Watson and Burt (2002) and the 'StMatt01' database as of October 31, 2004.

[d] 1998 survey data from Watson (2005) and the 'StMatt04' database as of December 31, 2004.

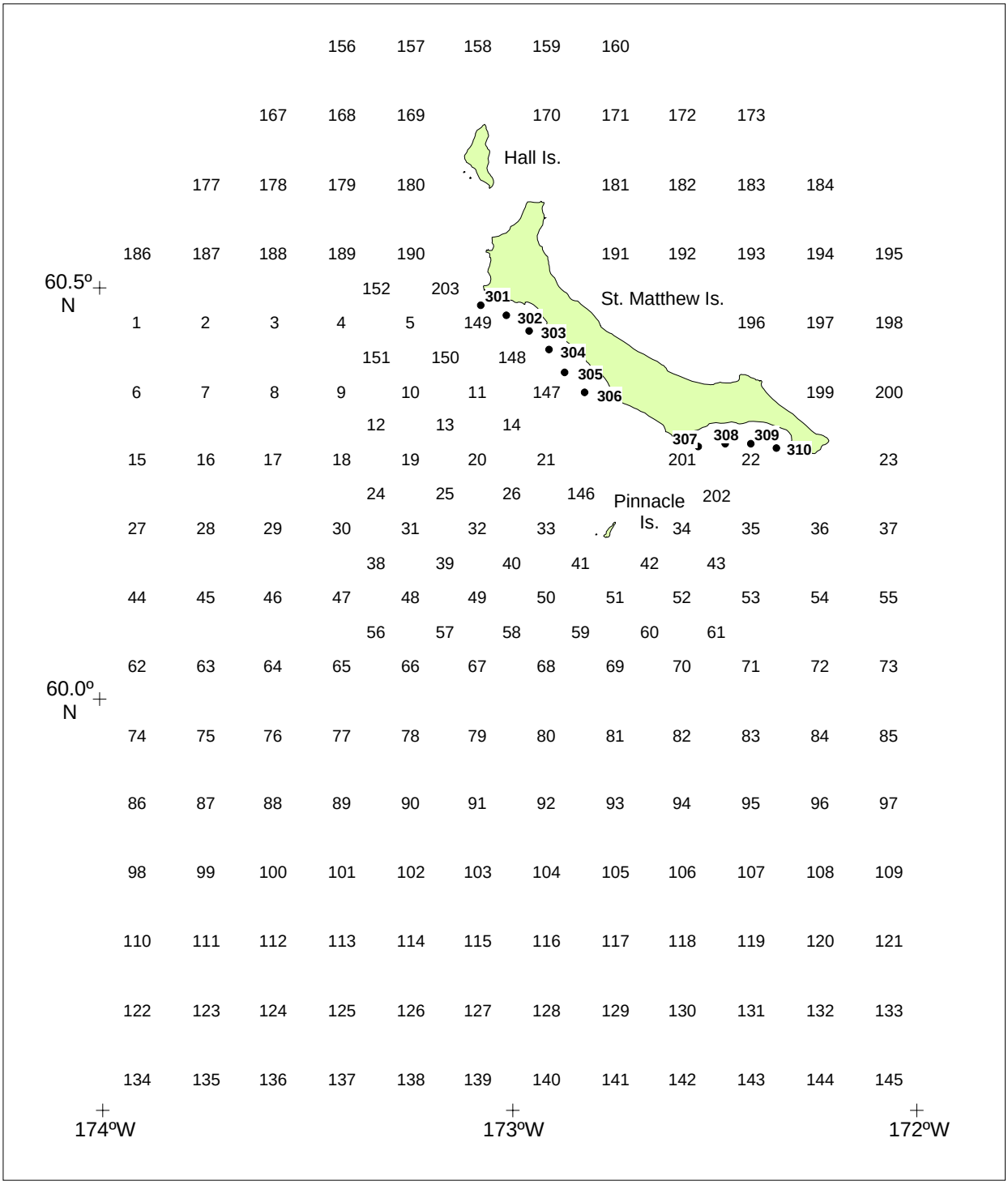

Figure 1.-Location of the 200-station grid established for triennial pot surveys of St. Matthew Island blue king crabs by the Alaska Department of Fish and Game in December 1995 (188 stations) and modified in June 2004 to include 12 additional stations.

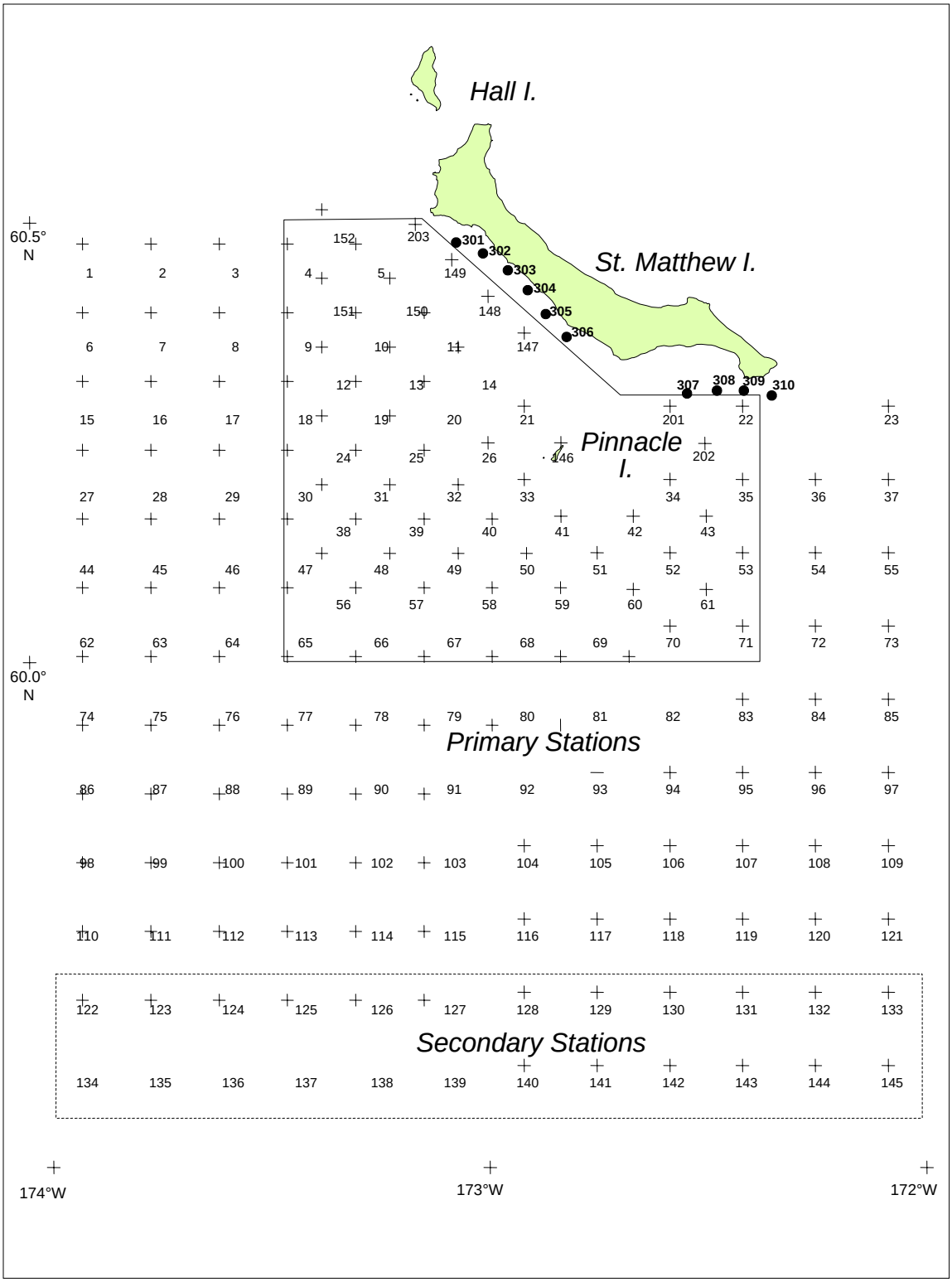

Figure 2.-Survey area and midpoint station locations for the 141 primary and 24 secondary stations to be fished during the 2007 St. Matthew Island blue king crab pot survey. Stratum 1 stations are outside the polygon, Stratum 2 stations are within the polygon, and Stratum 3 stations (shallow-waters) are noted in bold.

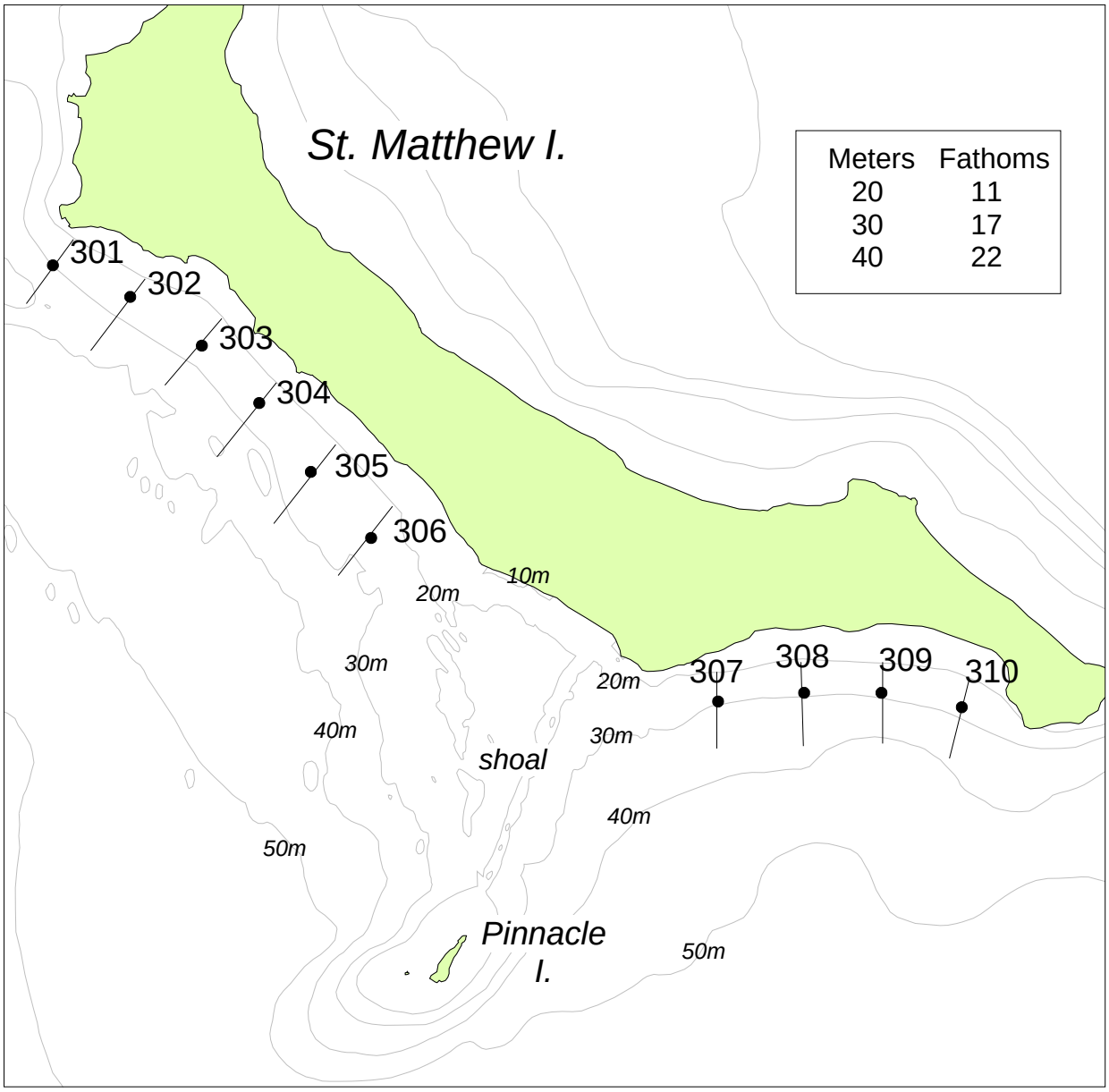

Figure 3.-Stratum 3 schematic array with bathymetric background for shallow-water stations 301 - 310 to be sampled during the 2007 St. Matthew Island pot survey.

APPENDIX A. SHIPBOARD INSTRUCTIONS FOR THE 2007 ST. MATTHEW ISLAND BLUE KING CRAB SURVEY

Appendix A1.-Shipboard instructions for the 2007 St. Matthew Island blue king crab survey.

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GENERAL INFORMATION FOR ADF&G CREW

The purpose of this manual is to provide instructions and information related to the 2007 St. Matthew Island triennial pot survey. Refer to this document for detailed sampling instructions, form completion or information not covered in the operational plan. Expect standard methodologies to be consistent, and be prepared to accept changes to sampling procedures and protocols when warranted.

- Please read the entire operational plan.
- By regulation, all survey data is confidential until the closure of the St. Matthew Island blue king crab commercial fishery, which occurs from October 15, 2007 through February 1, 2008. As this fishery has been closed since 1999 due to the overfished status of the stock, it is likely that the fishery will be closed preseason (unless an epic event of spontaneous population explosion has occurred!).

The 2007 survey will be conducted aboard the chartered FV *Sultan*, a 130-ft crab-pot-fishing vessel. The charter will be approximately 30 days in length, beginning on July 23 and ending on August 21, 2007.

The cruise leader will be responsible for resolving any conflicts that may arise between the vessel crew and ADF&G crew regarding charter service requirements.

The cruise leader will also be responsible for resolving any conflicts that may arise among the ADF&G crew. Insubordination to the cruise leader or captain will result in immediate suspension from at-sea duties, and if warranted, the subsequent return of the individual to Dutch Harbor.

Listed below are the names and titles of the personnel that will be participating in the survey:

- Leslie Watson – biologist, cruise leader
- Susie Byersdorfer - biologist
- Kevin Renfro – biologist
- Joyce Soong – biologist

Vessel Safety Briefing

Prior to survey departure, the captain will provide both the vessel and ADF&G crews with a shipboard safety orientation to include the following:

1. The location and operation of lifesaving and emergency equipment (EPIRBs, immersion suits, life rafts, and medical kits).
2. Operation of assigned equipment, including sounding of the general alarm.
3. Instructions for making a distress call.
4. What to do in the event of a person overboard.
5. What to do in the event of a fire or flooding.
6. What to do if an ‘abandon ship’ order is issued.

-continued-

Prior to the vessel's departure from Dutch Harbor, the captain, vessel crew and ADF&G crew will conduct, in the presence of USCG personnel, a fire fighting drill and an abandon ship drill.

After the vessel is underway, a drill will be held at an unspecified time to test the ability of the vessel and ADF&G crews to report to emergency locations and to don immersion suits and assist others to don theirs.

The safety and well being of the vessel and ADF&G crew as well as the vessel itself are the primary concern at all times during the charter. Obey the captain in this regard, as he is legally responsible for ensuring the safety of all onboard personnel. Do not go on the back deck or anywhere outside alone, especially when seas are rough. When gear is being worked, pay particular attention to buoy lines and trailers, pots, and slick decks. ADF&G personnel will not maneuver, bait, or unbait pots, operate hydraulics, or throw buoy lines. Be aware of the crane and hydraulic blocks at all times, particularly when pots are being moved. Do not stand under crane or boom arms at any time. Retreat to a safe area previously designated by the captain or deck boss while pots are being set, retrieved, moved, or stacked.

Immersion Suits and Personal Floatation Devices (PFDs)

Prior to vessel departure, it is the individual's responsibility to ensure that his/her immersion suit is ready for at-sea use. Supplied suits must be free of damage and have waxed, operable zippers. New 406 EPIRBs were purchased to replace the Mini B2 model that we have been using; ensure that you know how to activate the new EPIRB before attaching it to your suit. Supplied ACR FireFly3 strobe lights are new; ensure that new batteries have been installed and that you know how to turn it on before attaching it to your suit. A safety whistle must also be attached to your suit. Store your suit where you can easily get to it, away from heat registers and in a clean location.

Supplied personal floatation devices (PFDs) will be worn at all times when out on deck. Stormy Seas jackets are not USCG-approved PFDs and will not be used in lieu of the SOSpender PFDs supplied by ADF&G. New rearming kits have been installed and instructions for SOSpender use are attached to each PFD. Clean and inspect your PFD daily before use.

All EPIRBs, strobes, and cleaned PFDs will be returned to the Dutch Harbor office at the end of the survey for use on other BS/AI research surveys.

Shipboard Protocol for Bird-Handling (Asian H5N1 Avian Influenza)

We will use the 'better safe than sorry' approach for handling all species of birds that end up on the vessel. We will not be collecting dead seabirds for avian flu testing. Other than depositing dead birds back into the ocean or clearing disoriented live birds off the deck, the vessel and ADF&G crews will not handle birds that end up on the vessel. Disposable gloves will be provided and used for this purpose and the proper technique for glove removal will be demonstrated. ADF&G crew will read the memorandum from McKie Campbell, former ADF&G Commissioner regarding personal protection measures against Avian flu for additional information.

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Shipboard Rules and Reminders

Specific information and/or vessel policies will be provided for each of the following: storage location for rain gear and boots, galley etiquette, and water use policy for showers and laundry.

Prior to survey vessel departure, several of you will inventory and pack all necessary items on the equipment list (Appendix E1) to ensure that we have everything we need to conduct the survey. At-sea tasks and responsibilities for successful survey completion will be assigned on a rotating basis to each ADF&G biologist. Expect that you will be learning and executing all basic tasks whenever so directed by the cruise leader. The rule of the deck is that no one goes off-deck until sampling and clean-up are completed for the day.

Whenever possible, the cruise leader will explain why we are doing something in a particular way, but your willing cooperation in executing tasks that you don't want to do or that you don't understand is mandatory. If you are unsure about what is being asked of you, ask the cruise leader. Some of the tasks are: 1) measuring crab and fish; 2) identifying other captured species; 3) recording crab, species composition, fish measurements, and subsampling data; 4) daily data editing of all survey forms, 5) operating temperature data loggers and managing their deployment; 6) monitoring the QTC benthic habitat recorder; 7) deployment and retrieval of the Van Veen grab and preservation of seabed samples; 8) photography and special project assignments, and 9) clean-up of deck sampling area and gear.

Completed data forms will be edited and filed daily and kept in a safe, dry place inside the house. This practice ensures that the often-important short-term details of the day's events are not overlooked. Make sure deck paperwork tracks with the pilot house logs; every pot will have a unique number that will enable cross-referencing on a pot-by-pot basis. Although it is the crew leader's responsibility to ensure data integrity, it is expected that all at-sea staff will do their very best to aid in this effort (ask Watson-she'll tell you the exact dollar amount each completed data form is worth!).

All work areas used, including galley and pilothouse tables will be cleaned up immediately after use. All sampling equipment will be cleaned and stored safely inside the vessel at the end of each day (calipers, clipboards, measuring sticks, etc.). Books and other references will be available for use by all staff. They will be kept dry and clean, and stowed in an accessible location away from vessel crew working areas.

Keep a daily log of sampling activities and irregularities, hours worked, photographs taken, and other survey-related items that are not detailed on a sampling form. Any problems or concerns with survey procedures and suggestions for improving future surveys should also be noted in your daily log. Seabird and mammal observations will be tabulated by one lucky person, and that information will be forwarded to the appropriate federal agency.

There will be no home packing or unauthorized retention of any animals captured during the survey by vessel or ADF&G crewmembers. Sport fishing is allowed if a person has a valid 2007 fishing license. Subsistence and personal-use fishing is strictly prohibited. Collection of crabs and other animals will be allowed only as specifically directed by the cruise leader.

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Offer assistance to the vessel crew whenever possible. ADF&G personnel are allowed to help out with some of the deck activities that are not inherently dangerous, such as filling bait containers. When time allows, washing dishes, making coffee, cooking and general cleaning will be part of our daily routine. The vessel crew will have a busier schedule than the ADF&G crew; a cooperative effort toward daily chores and maintaining living quarters on the vessel can be a great benefit to everyone's morale.

Timesheets, Payroll Codes, Etc.

Time sheets for pay periods ending July 31, August 15, and August 31 will be filled out, signed by the cruise leader, and left at the Dutch Harbor office prior to survey departure. Ensure that your prepared timesheets are correctly coded as listed below.

Name	PCN	LOC	July – Aug. 2007 (BSCR VI)
Byersdorfer, S. – FB I	1117	CAA	11340645-11340645
Renfro, K. – FB I	1134	EBA	11340645-11340645
Soong, J. – FB I	1919	HTA	11340645-11340645
Watson, L. – FB II	1428	CAA	11340645-11340645

SURVEY AND SAMPLING PROTOCOLS

This section contains sampling and data recording information that has not already been addressed in the overall operational plan. To eliminate repetition of sampling and data recording instructions, refer to the specific form and code descriptions contained in Appendices B (itinerary and location), C (forms and instructions, D (crab code descriptions), and E (survey equipment list).

Catch Sampling

Crabs

Catch sampling is done on a priority basis to allow complete enumeration, sampling or subsampling, and documentation of blue king crabs captured in survey pots. If a sampled crab is unmeasurable (mangled, molted in the pot, etc.), that crab will be recorded on the Crab Measurement Form and biological characteristics that can be assessed will be documented.

Legal size status for blue king crabs and other commercially important king crabs captured in survey pots must be determined and recorded. Minimum legal sizes are as follows:

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Species	Minimum Legal Size
Blue king crab *Paralithodes platypus*	5.5" CW, outside lateral spines
Snow crab *Chionoecetes opilio*	3.1" CW, outside lateral spines
Tanner crab *C. bairdi*	5.5" CW, outside lateral spines
Hair crab *Erimacrus isenbeckii*	3.25" CW, outside lateral spines

'Riders' are defined as crabs that come up on, but not in, a sampled pot. During catch sampling, riders will not be counted, sampled, or recorded on survey forms. Crabs that fall back into the sea from the interior of the pot will not be counted, either. However, observations on crab loss from survey pots will be noted and if pot doors are not secured to prevent routine loss of pot contents, that pot will be repaired such that crabs are not routinely lost in successive pot lifts.

Other Species

All fishes and skates will be identified to the lowest taxonomic level possible, enumerated, and for select fishes, measured from each survey pot. No species will be recorded more than once on the Species Composition Form, i.e., the total count by species will be recorded.

Onboard QTC Data Management – R. Burt

Each time data acquisition is started, or an automatic file break occurs (every 2 hours), a new data directory is created in the base directory. The directory names are derived from the date and time at which acquisition was started. The format for the directory name is D:\qtc\raw\qtc4*yyyymmdd**hhmmss*.

For example, the data in the directory D:\qtc\raw\qtc4\20040217\101332 were created at 10:13:32 in the morning on Feb. 17, 2004.

There are several data files created in each data directory. The names and functions of each file are as follows:

1. **qtc4_raw**: Contains the amplitude time series for each trace acquired during logging. This is the primary data file that is imported into QTC IMPACT and used for bottom classification.
2. **gps_raw**: Contains the GPS NMEA strings acquired during logging. All NMEA strings are recorded, not just those used for parsing the navigation and time.
3. **acquisition.log**: This is a running status file used to record various real-time values generated during acquisition. The data in this file are used for debugging by QTC engineers and may also by used by operators in post processing to recall items of meta-data that are not recorded in the qtc4_raw file.

The memory space on the D: drive of the survey laptop computer is limited and therefore the data generated by QTC must be moved to the external hard drive every couple of days or so. If the D: drive gets too full, the drive will simply stop recording data.

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Moving the data from the D: drive to the external hard drive:

1. Set up a folder on the external hard drive to receive the daily QTC data folders. Name this folder QTCDataFrom*Survey* (for example, QTCDataFromStMatts2007).
2. Copy the data folder that QTC created for the day on the D: drive into the survey folder on the external hard drive.
3. After verifying the data was successfully copied, delete that days data from the survey laptop D: drive.

Creating backups of the QTC data must also be done 2 or 3 times during a survey to ensure data is not lost in the event of a computer meltdown or something going wrong with the vessels electrical system. The safest and most effective way to create independent backups of this data on the external hard drive is to burn it to CD's.

To do this:

1. It is necessary to zip the data files in order to get the as much of the QTC data onto a CD as possible. Within the folder created above by moving the data from the D: drive to the external hard drive, select the data folder you want to zip, right click on it and move down to the ZipGenius option and select the "Create *yyyymmdd*.zip".
2. A normal, 700mb recordable CD can hold about 10 to 12 days worth of zipped QTC data. Therefore, around days 10, 20 and 30 of the survey, a CD should be burned that will contain the previous 10 (or so) days worth of data. For example, the CD burned on day 10 would have the data from days 1-10, the CD burned on day 20 would have the data from days 11-20 and the CD burned on day 30 would have the data from days 21-30.
3. It works well to create a separate folder to store all this zipped data. Name this folder ZippedQTCDataFrom*Survey* (for example, ZippedQTCDataFromStMatts2007).
4. To reduce confusion as to which zipped files are to be (or have been) burned to a CD, it is helpful to create subfolders within the folder created above in step 3 to hold only the zipped files that are to be burned to the CD. Name these folders CDBackup*mm.dd*to*mm.dd*. For example, if the zipped QTC data files from August 2nd through August 11th fit onto a blank CD, name the folder CDBackup8.2to8.11.
5. Burn a CD when there is enough zipped data to comfortably fit onto a CD and clearly label it "Zipped QTC Data From *Survey*" and indicate the dates of the data "Data From *mm*/*dd*/*yy* to *mm*/*dd*/*yy*".

Another thing one could do to help reduce the possibility of losing data is to have the external hard drive plugged into the survey laptop **only** when you are actually using the external hard drive (when moving files from the D: drive, zipping files or burning a backup CD for example). Keeping it disconnected from the laptop while not in use reduces the possibility of something happening to the external hard drive in the event something goes wrong with the laptop or the vessels electrical system. That's it; now just don't lose the backup CD's!

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Special Projects

Snow Crab Growth Study – L. Slater

A snow crab growth study involving the sampling and collection of immature male and female snow crabs (*Chionoecetes opilio*) will be conducted during the 2007 St. Matthew Island blue king crab survey.

- A total of 90 immature female snow crabs measuring 40-mm to 60-mm CW will be collected; 15 crabs will be collected from each 5-mm CW range (Table 1).
- A total of 90 immature male snow crabs measuring 50-mm to 90-mm CW will be collected; 15 crabs will be collected from each 10-mm CW range (Table 1).

Immature and mature female snow crab can be distinguished by the shape of the abdominal flap, with immature female crabs having a smaller abdominal flap than mature female crabs (Jadamec et al 1999, Figure 15b,c). Immature and mature male snow crabs can be distinguished by claw size, with immature male crabs having a smaller claw size than mature crabs. A relationship between carapace width (CW) measurements (Jadamec et al 1999, Figure 21) and right chela height (CH) measurements (Jadamec et al 1999, Figure 25) was established by Otto (1998) and updated with data from the annual NMFS trawl surveys from 1989 – 2000, which can be used to distinguish immature from mature male snow crabs (Table 2).

A tally sheet is provided to track sample collections (Appendix C12). Crabs will be individually tagged by attaching a zip tie with a Floy tag threaded on it around the base of a leg. The date, pot number, tag number, sex, carapace width (CW), and chela height (CH) of males will be recorded on the Snow Crab Growth Data form (Appendix C13). Samples will then be placed in onion bags, up to 25 per bag, and held in the vessel's circulating seawater tanks. On return to port, R. Alinsunurin and R. Burt will pack the collected crabs and arrange for transport to Kodiak.

Jadamec, L.S., W.E. Donaldson and P. Cullenberg. 1999. Biological field techniques for *Chionoecetes* crabs. Fairbanks, University of Alaska Sea Grant College Program: 80pp.

Otto, R.S. 1998. Assessment of the eastern Bering Sea snow crab, *Chionoecetes opilio*, stock under the terminal molting hypothesis. *In* G.S. Jamieson and A. Campbell, Proceedings of the North Pacific Symposium on Invertebrate Stock Assessment and Management. Can. Spec. Publ. Fish. Aquat. Sci., pp. 109-124.

-continued-

Table 1. Sample size goals for immature snow crabs by sex and size range.

Females		Males	
Size (mm CW)	Number	Size (mm CW)	Number
< 40.0	15	< 50.0	15
40.0 – 44.9	15	50.0 – 59.9	15
45.0 – 49.9	15	60.0 – 69.9	15
50.0 – 54.9	15	70.0 – 79.9	15
55.0 – 59.9	15	80.0 – 89.9	15
≥ 60.0	15	≥ 90.0	15
Total:	90	Total:	90

Table 2. Quick reference guide to distinguish immature from mature male snow crabs. For a given carapace width (CW) range, the maximum right chela height (CH) of an immature male snow crab is shown. If the chela height is greater than the maximum CH for the CW of a given crab, it will be considered mature and will not be collected.

Carapace Width (mm)	Maximum Chela Height (mm)
35 – 40	7
40 – 45	8
45 – 50	9
50 – 55	11
55 – 60	12
60 – 65	13
65 – 70	14
70 – 75	15
75 – 80	17
80 – 85	18
85 – 90	19
90 – 95	21
95 -100	22
100 – 105	24
105 – 110	25
110 – 115	26
115 - 120	28

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Crab Shell Condition Photographs - Laura Slater

Purpose: Alaska Department of Fish and Game (ADF&G) biologists, with assistance from National Marine Fisheries Service (NMFS) biologists, will begin to develop a photograph index of shell conditions of crab species encountered during the ADF&G 2007 St. Matthew Island blue king crab survey and the 2007 NMFS EBS trawl survey. These photographs will be used to train ADF&G research biologists, dockside samplers, and crab observers to determine shell condition in a consistent and reliable manner. They will also allow for comparison of shell conditions encountered among geographic areas within and between surveys and between the summer surveys and the winter fisheries.

Objective: During the ADF&G 2007 St. Matthew Island blue king crab survey, crab species that will primarily be encountered and sampled for photographs of shell condition will be blue king crabs (*Paralithodes platypus*) and snow crabs (*Chionoecetes opilio*); Tanner crabs (*C. bairdi*) and/or hair crabs (*Erimacrus isenbeckii*) may also be encountered and sampled as time permits. Please attempt to document multiple crab samples for each species and sex. Samples should be selected based on two criteria: 1) those that are representative of a given shell condition description (Appendix D1) and 2) those that may be difficult to determine the shell condition code for as the crab may display characteristics of more than one shell condition description. For each sampled crab, please take five images, in consecutive order:

Photo 1 – Text label that shows information on the crab sample and collection location (see protocol).

Photo 2 – Dorsal view of the entire crab (Figure 1a).

Photo 3 – Close-up of the dorsal view that includes the lateral carapace margin area of the crab (Figure 1b).

Photo 4 – Ventral view of the entire crab (Figure 2a).

Photo 5 – Close-up of the ventral view that includes the lateral carapace margin area of the crab (Figure 2b).

The intent of the close-up images are to clearly display the carapace margin, coxa to merus segments, and sternites in order to assess wear of spines, grasping marks, coloration, and scratches. Provided these five images are taken sequentially for each crab, there is no need to include text in the photographs of the crab themselves (Photos 2 – 5).

Protocol:

1. Document crab sample and collection location information on the dry erase board:
    - Species (i.e., BKC)
    - Date (i.e., 8/6/07)
    - Shell condition code (i.e., SC=2)
    - Sex (i.e., F)
    - Survey code and sequential pot number (i.e., SMO7-58)

-continued-

Take a photograph of this information immediately prior to the photographs of the crab this information applies to. This will allow us to match the information with the crab images by consecutive photo number (and avoids the need for separate written documentation).

2. Arrange the crab for photographs in a well-lit area. Preferably, photographs should be taken with a light-colored or white backdrop. The dry erase board can be used as a white backdrop if the crab fits on it.
3. Take two photographs of the dorsal view, one that includes the entire crab and one that is a close-up of the carapace margin area (Figure 1), and two photographs of the ventral view, one that includes the entire crab and one that is a close-up of the carapace margin area (Figure 2).
4. Images can remain on the memory card with the camera if the provided ADF&G camera (Pentax Optio W20) is used or transferred to CD if a different camera is used or if the memory card becomes limited. The provided ADF&G camera is pre-set to take 5 megapixel images using the 'natural portrait' image mode, but camera settings can be adjusted as needed to maximize the image quality. Please return the camera and/or CDs of images to Laura Slater after the survey.

Other special projects aboard the vessel include:

1. Collection and preservation of fish specimens for verification of species identification. Select fishes will be frozen, labeled, and sent to K. Mecklenburg of the Point Stephens Research, Auke Bay, Alaska. Confirmed identifications will then be sent to R. Burt, ADF&G-Dutch Harbor for correction of the Species Composition data table.

2. Collection and preservation of invertebrates for verification of species identification. Select invertebrates will be preserved, labeled, and sent to ADF&G in Kodiak. S. Byersdorfer will be responsible for confirming identifications and forwarding that information to R. Burt, ADF&G-Dutch Harbor for correction of the Species Composition data table.

3. Photography of fish and invertebrates for inclusion and updating of a field guide to common fish and invertebrates of the St. Matthew Island area. S. Byersdorfer will be responsible for this activity, with assistance from all onboard staff.

All photographs, collected specimens, and data taken in support of stated survey objectives and other special projects are the property of the BS/AI Crab Research project and will be made available to all BS/AI crab research personnel on request.

-continued-

Figure 1. Example of photographs of the dorsal view of the entire crab (a) and a close-up of the carapace margin area (b).

a.)

b.)

-continued-

Figure 2. Example of photographs of the ventral view of the entire crab (a) and a close-up of the carapace margin area (b).

a.)

b.)

-continued-

INSTRUCTIONS TO THE CAPTAIN

Survey Overview

The 2007 survey station grid is within the area between 59°30' and 60°30' N latitude and 172°00 and 174°00' W longitude and is composed of 141 primary and 24 secondary stations. Stations in Stratums 1 and 2 are 5 nmi apart and will be sampled using 4 king crab pots spaced 0.125 nmi apart and arrayed either north-to-south or east-to-west, depending on wind or tide conditions. Stratum 3 shallow-water stations are 2 nmi apart and will consist of 4 pots set in a line perpendicular to shore and spaced at 3-fm intervals to sample the 11-fm to 20-fm depth range. The target soak time for each pot within a station is 30 - 36 hours. To achieve the target soak time, stations will be set in 'blocks' of 6 to 8 stations (Appendices B1 and B2). Mid-point station coordinates for the 2007 survey are listed in Appendix B3 and will be provided in electronic format to be uploaded to the vessel's computer. Ninety identical king crab pots measuring 7-ft x 7-ft x 34-in supplied by ADF&G will be used. Each pot is webbed with #92 nylon twine with a stretch mesh of 2¾ in and has two opposing 8-in x 36-in tunnel eye openings. Each pot will be baited with one gallon of frozen chopped **Pacific herring**.

If the 141 primary stations have been successfully sampled, the secondary stations may also be fished (Appendix B3). Adequate time to fish both primary and secondary stations is expected; however, inclement weather or other factors may occasionally hamper survey progress. If all designated survey stations are sampled, additional stations from areas to the north of St. Matthew and Hall Islands may be sampled using coordinates from the established 200-station survey grid (Appendix B4).

Setting and Retrieving Gear

The Survey Pilot House Log will be used to report all required data for each pot when setting or retrieving gear (Appendix C1). Unique, sequential pot numbers will be assigned for each pot in successive stations beginning with the numeral 1. Record the latitude and longitude to the nearest one-hundredth of a minute; this information must be recorded at the time each pot is set, not at the time it is pulled. Pilot house logs must be accurately completed each day. Please use pencils to record all data.

Prior to gear deployment, a temperature logger will be secured in the second pot at each station fished. Each logger will be externally marked to correspond with a three-digit ID number; units 219, 221-225, 229, and 232-234 will be used. Please make sure the crew tells you which logger ID number is put in that pot. If a logger is placed in a pot other than the second one, the crew must identify and report which pot contains the unit. Each logger will be secured inside the top of the pot during baiting by attaching 3 sets of door rubbers to the unit and hooking it to the pot mesh so that the unit doesn't hit the pot frame.

A Weather Observation Form will be completed daily for each station set and for each station picked (2 observations per station). If weather observations are made at non-station locations, leave the station number blank and complete the rest of the form as directed (Appendix C11).

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We will try to stay on a schedule of retrieving the first pot by 0700 hours each day. Notify the ADF&G crew at least 30 minutes before the first pot is pulled in the morning so that we are ready for sampling. As each pot comes aboard, you must tell the ADF&G deck crew what the sequential pot number (SPN) is for that pot.

- ✓If a pot is lost prior to retrieval, set without bait, or did not fish properly, note that on the Pilot House Log, and inform the ADF&G deck crew. Do not erase the sequential pot number of any lost pot or pot that had a poor performance.
- ✓If the 4-pot string is pulled in reverse order from the order in which the string was set, please notify the ADF&G deck crew of the proper SPN and that the string is being pulled in reverse order.

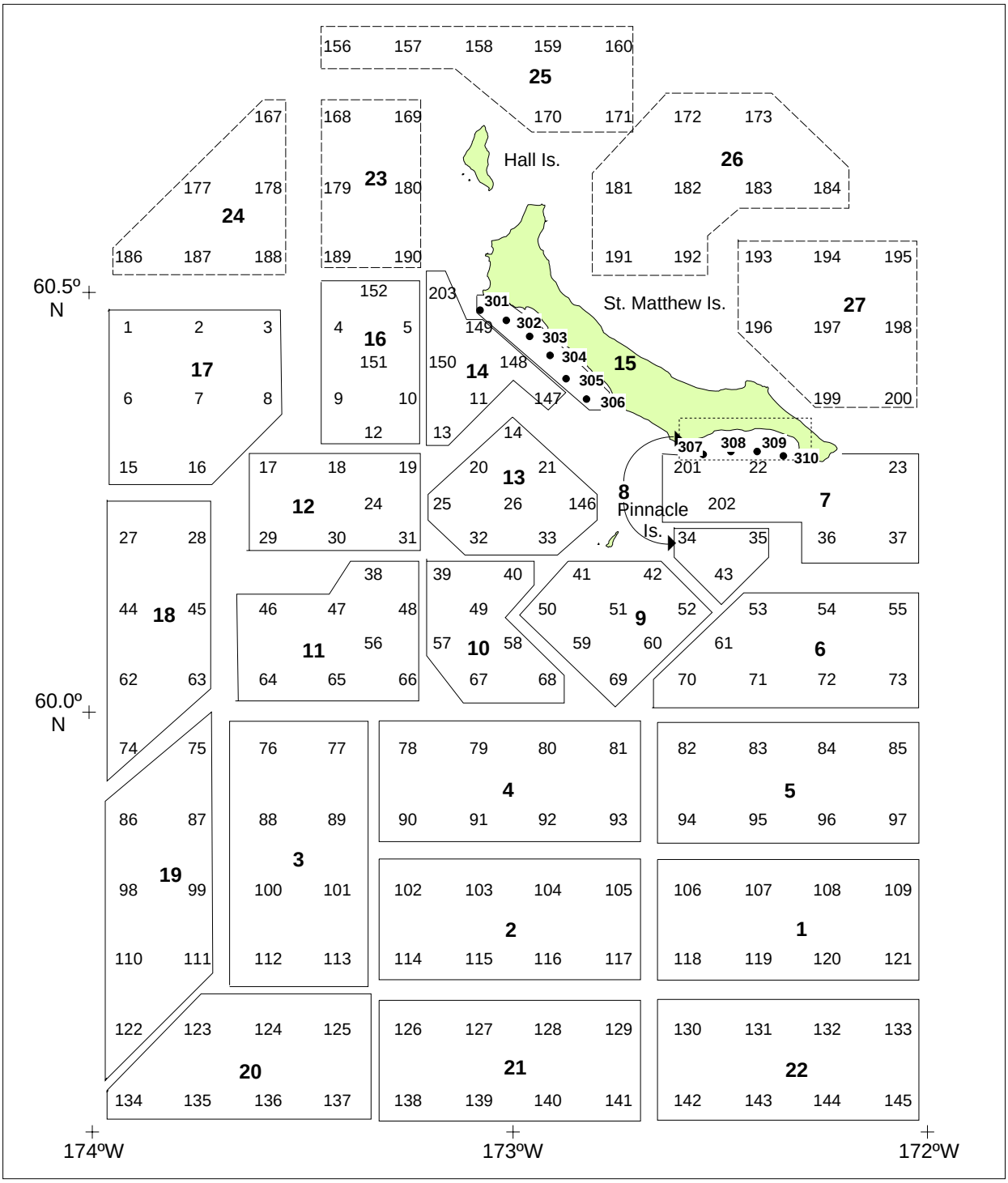
Email Schedules

The captain will check in daily via email to Blue North Fisheries office to report the vessel's location. Inmarset C (Stratos) from the vessel will be used daily by the ADF&G cruise leader to convey basic catch information to the Kodiak and Dutch Harbor offices. Use of the ship's satellite telephone will only be used for emergencies or if Inmarset C is not functioning. ADF&G crew will not use either means of communications for personal use unless authorized by the cruise leader.

APPENDIX B. SURVEY ITINERARY AND LOCATION

Appendix B1.-Itinerary for the 2007 St. Matthew Island blue king crab survey.

Date	Activity		Stations Set
July			
23	Load survey gear and travel to survey area.	-	-
24	Set Block 1 (sta. 106, 107, 108, 109, 118, 119, 120, 121)	-	8
25	Set Block 2 (sta.102, 103, 104, 105, 114, 115, 116, 117)	Pick Block 1	8
26	Set Block 3 (sta.76, 77, 88, 89, 100, 101, 112, 113)	Pick Block 2	8
27	Set Block 4 (sta.78 ,79, 80, 81, 90, 91, 92, 93)	Pick Block 3	8
28	Set Block 5 (sta.82, 83, 84, 85, 94, 95, 96, 97)	Pick Block 4	8
29	Set Block 6 (sta.53, 54, 55, 61, 70, 71, 72, 73	Pick Block 5	8
30	Set Block 7 (sta.22, 23, 36, 37, 201, 202)	Pick Block 6	8
31	Set Block 8 (sta.34, 35, 43, 307, 308, 309, 310)	Pick Block 7	6
August			
1	Set Block 9 (sta. 41, 42, 50, 51, 52, 59, 60, 69)	Pick Block 8	7
2	Set Block 10 (sta. 39, 40, 49, 57, 58, 67, 68)	Pick Block 9	8
3	Set Block 11 (sta. 38, 46, 47, 48, 56, 64, 65, 66)	Pick Block 10	7
4	Set Block 12 (sta. 17, 18, 19, 24, 29, 30, 31)	Pick Block 11	8
5	Set Block 13 (sta. 14, 20, 21, 25, 26, 32, 33, 146)	Pick Block 12	7
6	Set Block 14 (sta. 11, 13, 147, 148, 149, 150, 203)	Pick Block 13	8
7	Set Block 15 (sta. 301, 302, 303, 304, 305, 306)	Pick Block 14	7
8	Set Block 16 (sta. 4, 5, 9, 10, 12, 151, 152)	Pick Block 15	6
9	Set Block 17 (sta. 1, 2, 3, 6, 7, 8, 15, 16)	Pick Block 16	7
10	Set Block 18 (sta. 27, 28, 44, 45, 62, 63, 74)	Pick Block 17	8
11	Set Block 19 (sta. 75, 86, 87, 98, 99, 110, 111, 122)	Pick Block 18	7
12	Set Block 20 (sta. 123, 124, 125, 134, 135, 136, 137)	Pick Block 19	8
13	Set Block 21 (sta. 126, 127, 128, 129, 138, 139, 140, 141)	Pick Block 20	7
14	Set Block 22 (sta. 130, 131, 132, 133, 142, 143, 144, 145)	Pick Block 21	8
15	Time-permitting, set additional Block 23 (sta. 168, 169, 179, 180, 189, 190)	Pick Block 22	6
16	Set additional Block 24 (sta. 157, 158, 159, 167, 168, 169)	Pick Block 23	6
17	Set additional Block 25 (sta. 156, 157, 158, 159, 160, 170, 171)	Pick Block 24	7
18	Set additional Block 26 (sta. 172, 173, 181, 182, 183, 184. 191, 192)	Pick Block 25	8
19	Set additional Block 27 (sta. 193, 194, 195, 196, 197, 198, 199, 200)	Pick Block 26	8
20	Pick Block 27 and travel to Dutch Harbor.	Pick Block 27	-
21	Travel to Dutch Harbor and offload survey gear.	Total Stations Fished	200



Appendix B2.-Layout of the 22 station blocks to be fished during the 2007 St. Matthew Island blue king crab survey; additional blocks 23 - 27 (dashed outline) may be sampled if survey time permits.

Appendix B3.-Midpoint latitude and longitude coordinates for the 141 primary and 24 secondary stations (noted in italics) to be fished during the 2007 St. Matthew Island blue king crab survey; an additional 35 stations in the northern portion of Stratum 1 may be sampled if survey time permits.

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
1	1	60	27.50	173	55.00
2	1	60	27.50	173	45.00
3	1	60	27.50	173	35.00
4	2	60	27.50	173	25.00
5	2	60	27.50	173	15.00
6	1	60	22.50	173	55.00
7	1	60	22.50	173	45.00
8	1	60	22.50	173	35.00
9	2	60	22.50	173	25.00
10	2	60	22.50	173	15.00
11	2	60	22.50	173	5.00
12	2	60	20.00	173	20.00
13	2	60	20.00	173	10.00
14	2	60	20.00	173	0.00
15	1	60	17.50	173	55.00
16	1	60	17.50	173	45.00
17	1	60	17.50	173	35.00
18	2	60	17.50	173	25.00
19	2	60	17.50	173	15.00
20	2	60	17.50	173	5.00
21	2	60	17.50	172	55.00
22	2	60	17.50	172	25.00
23	1	60	17.50	172	5.00
24	2	60	15.00	173	20.00
25	2	60	15.00	173	10.00
26	2	60	15.00	173	0.00
27	1	60	12.50	173	55.00
28	1	60	12.50	173	45.00
29	1	60	12.50	173	35.00
30	2	60	12.50	173	25.00
31	2	60	12.50	173	15.00
32	2	60	12.50	173	5.00
33	2	60	12.50	172	55.00
34	2	60	12.50	172	35.00
35	2	60	12.50	172	25.00
36	1	60	12.50	172	15.00
37	1	60	12.50	172	5.00
38	2	60	10.00	173	20.00
39	2	60	10.00	173	10.00
40	2	60	10.00	173	0.00
41	2	60	10.00	172	50.00
42	2	60	10.00	172	40.00
43	2	60	10.00	172	30.00

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Appendix B3.-(page 2 of 4)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
44	1	60	7.50	173	55.00
45	1	60	7.50	173	45.00
46	1	60	7.50	173	35.00
47	2	60	7.50	173	25.00
48	2	60	7.50	173	15.00
49	2	60	7.50	173	5.00
50	2	60	7.50	172	55.00
51	2	60	7.50	172	45.00
52	2	60	7.50	172	35.00
53	2	60	7.50	172	25.00
54	1	60	7.50	172	15.00
55	1	60	7.50	172	5.00
56	2	60	5.00	173	20.00
57	2	60	5.00	173	10.00
58	2	60	5.00	173	0.00
59	2	60	5.00	172	50.00
60	2	60	5.00	172	40.00
61	2	60	5.00	172	30.00
62	1	60	2.50	173	55.00
63	1	60	2.50	173	45.00
64	1	60	2.50	173	35.00
65	2	60	2.50	173	25.00
66	2	60	2.50	173	15.00
67	2	60	2.50	173	5.00
68	2	60	2.50	172	55.00
69	2	60	2.50	172	45.00
70	2	60	2.50	172	35.00
71	2	60	2.50	172	25.00
72	1	60	2.50	172	15.00
73	1	60	2.50	172	5.00
74	1	59	57.50	173	55.00
75	1	59	57.50	173	45.00
76	1	59	57.50	173	35.00
77	1	59	57.50	173	25.00
78	1	59	57.50	173	15.00
79	1	59	57.50	173	5.00
80	1	59	57.50	172	55.00
81	1	59	57.50	172	45.00
82	1	59	57.50	172	35.00
83	1	59	57.50	172	25.00
84	1	59	57.50	172	15.00
85	1	59	57.50	172	5.00
86	1	59	52.50	173	55.00
87	1	59	52.50	173	45.00
88	1	59	52.50	173	35.00

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Appendix B3.-(page 3 of 4)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
89	1	59	52.50	173	25.00
90	1	59	52.50	173	15.00
91	1	59	52.50	173	5.00
92	1	59	52.50	172	55.00
93	1	59	52.50	172	45.00
94	1	59	52.50	172	35.00
95	1	59	52.50	172	25.00
96	1	59	52.50	172	15.00
97	1	59	52.50	172	5.00
98	1	59	47.50	173	55.00
99	1	59	47.50	173	45.00
100	1	59	47.50	173	35.00
101	1	59	47.50	173	25.00
102	1	59	47.50	173	15.00
103	1	59	47.50	173	5.00
104	1	59	47.50	172	55.00
105	1	59	47.50	172	45.00
106	1	59	47.50	172	35.00
107	1	59	47.50	172	25.00
108	1	59	47.50	172	15.00
109	1	59	47.50	172	5.00
110	1	59	42.50	173	55.00
111	1	59	42.50	173	45.00
112	1	59	42.50	173	35.00
113	1	59	42.50	173	25.00
114	1	59	42.50	173	15.00
115	1	59	42.50	173	5.00
116	1	59	42.50	172	55.00
117	1	59	42.50	172	45.00
118	1	59	42.50	172	35.00
119	1	59	42.50	172	25.00
120	1	59	42.50	172	15.00
121	1	59	42.50	172	5.00
122	1	59	37.50	173	55.00
123	1	59	37.50	173	45.00
124	1	59	37.50	173	35.00
125	1	59	37.50	173	25.00
126	1	59	37.50	173	15.00
127	1	59	37.50	173	5.00
128	1	59	37.50	172	55.00
129	1	59	37.50	172	45.00
130	1	59	37.50	172	35.00
131	1	59	37.50	172	25.00
132	1	59	37.50	172	15.00
133	1	59	37.50	172	5.00

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		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
134	1	59	32.50	173	55.00
135	1	59	32.50	173	45.00
136	1	59	32.50	173	35.00
137	1	59	32.50	173	25.00
138	1	59	32.50	173	15.00
139	1	59	32.50	173	5.00
140	1	59	32.50	172	55.00
141	1	59	32.50	172	45.00
142	1	59	32.50	172	35.00
143	1	59	32.50	172	25.00
144	1	59	32.50	172	15.00
145	1	59	32.50	172	5.00
146	2	60	15.00	172	50.00
147	2	60	22.50	172	55.00
148	2	60	25.00	173	0.00
149	2	60	27.50	173	5.00
150	2	60	25.00	173	10.00
151	2	60	25.00	173	20.00
152	2	60	30.00	173	20.00
201	2	60	17.50	172	35.00
202	2	60	14.95	172	30.17
203	2	60	29.92	173	9.99
301	3	60	28.67	173	4.38
302	3	60	27.92	173	0.68
303	3	60	26.77	172	57.26
304	3	60	25.42	172	54.53
305	3	60	23.79	172	52.06
306	3	60	22.23	172	49.19
307	3	60	18.37	172	32.63
308	3	60	18.57	172	28.53
309	3	60	18.57	172	24.83
310	3	60	18.23	172	21.00

Appendix B4.-Midpoint latitude and longitude coordinates for the 200-station grid established for triennial pot surveys of St. Matthew Island blue king crabs by the Alaska Department of Fish and Game in December 1995 (188 stations) and modified in June 2004 to include 12 additional stations.

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
1	1	60	27.50	173	55.00
2	1	60	27.50	173	45.00
3	1	60	27.50	173	35.00
4	2	60	27.50	173	25.00
5	2	60	27.50	173	15.00
6	1	60	22.50	173	55.00
7	1	60	22.50	173	45.00
8	1	60	22.50	173	35.00
9	2	60	22.50	173	25.00
10	2	60	22.50	173	15.00
11	2	60	22.50	173	5.00
12	2	60	20.00	173	20.00
13	2	60	20.00	173	10.00
14	2	60	20.00	173	0.00
15	1	60	17.50	173	55.00
16	1	60	17.50	173	45.00
17	1	60	17.50	173	35.00
18	2	60	17.50	173	25.00
19	2	60	17.50	173	15.00
20	2	60	17.50	173	5.00
21	2	60	17.50	172	55.00
22	2	60	17.50	172	25.00
23	1	60	17.50	172	5.00
24	2	60	15.00	173	20.00
25	2	60	15.00	173	10.00
26	2	60	15.00	173	0.00
27	1	60	12.50	173	55.00
28	1	60	12.50	173	45.00
29	1	60	12.50	173	35.00
30	2	60	12.50	173	25.00
31	2	60	12.50	173	15.00
32	2	60	12.50	173	5.00
33	2	60	12.50	172	55.00
34	2	60	12.50	172	35.00
35	2	60	12.50	172	25.00
36	1	60	12.50	172	15.00
37	1	60	12.50	172	5.00
38	2	60	10.00	173	20.00
39	2	60	10.00	173	10.00
40	2	60	10.00	173	0.00
41	2	60	10.00	172	50.00
42	2	60	10.00	172	40.00
43	2	60	10.00	172	30.00

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Appendix B4.-(page 2 of 5)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
44	1	60	7.50	173	55.00
45	1	60	7.50	173	45.00
46	1	60	7.50	173	35.00
47	2	60	7.50	173	25.00
48	2	60	7.50	173	15.00
49	2	60	7.50	173	5.00
50	2	60	7.50	172	55.00
51	2	60	7.50	172	45.00
52	2	60	7.50	172	35.00
53	2	60	7.50	172	25.00
54	1	60	7.50	172	15.00
55	1	60	7.50	172	5.00
56	2	60	5.00	173	20.00
57	2	60	5.00	173	10.00
58	2	60	5.00	173	0.00
59	2	60	5.00	172	50.00
60	2	60	5.00	172	40.00
61	2	60	5.00	172	30.00
62	1	60	2.50	173	55.00
63	1	60	2.50	173	45.00
64	1	60	2.50	173	35.00
65	2	60	2.50	173	25.00
66	2	60	2.50	173	15.00
67	2	60	2.50	173	5.00
68	2	60	2.50	172	55.00
69	2	60	2.50	172	45.00
70	2	60	2.50	172	35.00
71	2	60	2.50	172	25.00
72	1	60	2.50	172	15.00
73	1	60	2.50	172	5.00
74	1	59	57.50	173	55.00
75	1	59	57.50	173	45.00
76	1	59	57.50	173	35.00
77	1	59	57.50	173	25.00
78	1	59	57.50	173	15.00
79	1	59	57.50	173	5.00
80	1	59	57.50	172	55.00
81	1	59	57.50	172	45.00
82	1	59	57.50	172	35.00
83	1	59	57.50	172	25.00
84	1	59	57.50	172	15.00
85	1	59	57.50	172	5.00
86	1	59	52.50	173	55.00
87	1	59	52.50	173	45.00
88	1	59	52.50	173	35.00

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Appendix B4.-(page 3 of 5)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
89	1	59	52.50	173	25.00
90	1	59	52.50	173	15.00
91	1	59	52.50	173	5.00
92	1	59	52.50	172	55.00
93	1	59	52.50	172	45.00
94	1	59	52.50	172	35.00
95	1	59	52.50	172	25.00
96	1	59	52.50	172	15.00
97	1	59	52.50	172	5.00
98	1	59	47.50	173	55.00
99	1	59	47.50	173	45.00
100	1	59	47.50	173	35.00
101	1	59	47.50	173	25.00
102	1	59	47.50	173	15.00
103	1	59	47.50	173	5.00
104	1	59	47.50	172	55.00
105	1	59	47.50	172	45.00
106	1	59	47.50	172	35.00
107	1	59	47.50	172	25.00
108	1	59	47.50	172	15.00
109	1	59	47.50	172	5.00
110	1	59	42.50	173	55.00
111	1	59	42.50	173	45.00
112	1	59	42.50	173	35.00
113	1	59	42.50	173	25.00
114	1	59	42.50	173	15.00
115	1	59	42.50	173	5.00
116	1	59	42.50	172	55.00
117	1	59	42.50	172	45.00
118	1	59	42.50	172	35.00
119	1	59	42.50	172	25.00
120	1	59	42.50	172	15.00
121	1	59	42.50	172	5.00
122	1	59	37.50	173	55.00
123	1	59	37.50	173	45.00
124	1	59	37.50	173	35.00
125	1	59	37.50	173	25.00
126	1	59	37.50	173	15.00
127	1	59	37.50	173	5.00
128	1	59	37.50	172	55.00
129	1	59	37.50	172	45.00
130	1	59	37.50	172	35.00
131	1	59	37.50	172	25.00
132	1	59	37.50	172	15.00
133	1	59	37.50	172	5.00

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Appendix B4.-(page 4 of 5)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
134	1	59	32.50	173	55.00
135	1	59	32.50	173	45.00
136	1	59	32.50	173	35.00
137	1	59	32.50	173	25.00
138	1	59	32.50	173	15.00
139	1	59	32.50	173	5.00
140	1	59	32.50	172	55.00
141	1	59	32.50	172	45.00
142	1	59	32.50	172	35.00
143	1	59	32.50	172	25.00
144	1	59	32.50	172	15.00
145	1	59	32.50	172	5.00
146	2	60	15.00	172	50.00
147	2	60	22.50	172	55.00
148	2	60	25.00	173	0.00
149	2	60	27.50	173	5.00
150	2	60	25.00	173	10.00
151	2	60	25.00	173	20.00
152	2	60	30.00	173	20.00
156	1	60	47.50	173	25.00
157	1	60	47.50	173	15.00
158	1	60	47.50	173	5.00
159	1	60	47.50	172	55.00
160	1	60	47.50	172	45.00
167	1	60	42.50	173	35.00
168	1	60	42.50	173	25.00
169	1	60	42.50	173	15.00
170	1	60	42.50	172	55.00
171	1	60	42.50	172	45.00
172	1	60	42.50	172	35.00
173	1	60	42.50	172	25.00
177	1	60	37.50	173	45.00
178	1	60	37.50	173	35.00
179	1	60	37.50	173	25.00
180	1	60	37.50	173	15.00
181	1	60	37.50	172	45.00
182	1	60	37.50	172	35.00
183	1	60	37.50	172	25.00
184	1	60	37.50	172	15.00
186	1	60	32.50	173	55.00
187	1	60	32.50	173	45.00
188	1	60	32.50	173	35.00
189	1	60	32.50	173	25.00
190	1	60	32.50	173	15.00
191	1	60	32.50	172	45.00

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Appendix B4.-(page 5 of 5)

		N Latitude		W Longitude	
Station	Stratum	Degrees	Minutes	Degrees	Minutes
192	1	60	32.50	172	35.00
193	1	60	32.50	172	25.00
194	1	60	32.50	172	15.00
195	1	60	32.50	172	5.00
196	1	60	27.50	172	25.00
197	1	60	27.50	172	15.00
198	1	60	27.50	172	5.00
199	1	60	22.50	172	15.00
200	1	60	22.50	172	5.00
201	2	60	17.50	172	35.00
202	2	60	14.95	172	30.17
203	2	60	29.92	173	9.99
301	3	60	28.67	173	4.38
302	3	60	27.92	173	0.68
303	3	60	26.77	172	57.26
304	3	60	25.42	172	54.53
305	3	60	23.79	172	52.06
306	3	60	22.23	172	49.19
307	3	60	18.37	172	32.63
308	3	60	18.57	172	28.53
309	3	60	18.57	172	24.83
310	3	60	18.23	172	21.00

APPENDIX C. SURVEY DATA FORMS AND INSTRUCTIONS

Appendix C1.–Survey pilot house log.

Survey Pilot House Log

Vessel Name:_____ Survey Code: _____ ADF&G Number:_____

Captain Name:_____ Page _____ of _____

	SPN	STATION NUMBER	BUOY ID	SET GEAR		DEPTH (fathoms)	BOTTOM TYPE	LOCATION		LOGGER ID	LIFT GEAR		GEAR PERF.
				DATE (mm/dd/yy)	TIME (0000-2359)			LATITUDE (N) (dd°mm.mm)	LONGITUDE E or W (ddd°mm.mm)		DATE (mm/dd/yy)	TIME (0000-2359)	
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

BOTTOM TYPE:
1 = rock
2 = sand
3 = silt
4 = mud
5 = gravel

GEAR PERFORMANCE:
blank = good
40 = lost pot
41 = pot door bent or not tied
42 = pot not baited
43 = pot landed upside down

ADF&G SHELLFISH RESEARCH-REV. April 9, 2007

-continued-

INSTRUCTIONS FOR SURVEY PILOT HOUSE LOG

This form is used to record fishing parameters for every pot that is set during the survey. It is the definitive table in the survey database and must be accurately completed each day gear is set or pulled.

Survey Code: To be determined.

ADF&G Number: 58039

Page ___ of ___ : The pages of this form will be numbered sequentially as they are generated over the course of the survey. When the last page is numbered, that number will be written in the 2nd blank on all the pages. For example: A total of 47 Pilot House Log pages were used during the survey. 'Page 1 of 47' would be on the first page, and 'Page 47 of 47' would be on the last page.

Vessel Name:

Captain's Name:

Sequential Pot Number (SPN): As pots are set, the captain will number them beginning at '1' and then number each successive pot sequentially over the course of the survey. Sequential pot numbers are unique and **will not** be reused if a pot is lost.

Station Number: The captain will record the station number for each sequential pot set. For our survey, there will be one station number per 4-pot string. If a station is resampled, the numeral 2 will precede the new station number in a 4-digit format. For example: station 6 has been reset and will be documented as station 2006. Similarly, station 141 has been reset and is identified as station 2141.

Buoy ID: The ID and/or letters marked on the trailer buoy of the pot buoy set-up will be recorded.

Set Gear

Date: The captain will record the date the gear is set, in mm/dd/yy format.

Time: The captain will record the time the gear is set, in local Alaska time and in 24-hour format (0000 – 2359). '0000' is midnight and denotes the beginning of the next day.

Depth: The captain will record depth in whole fathoms, or to the tenth of a fathom if electronically displayed.

Bottom Type: Enter one of five bottom type codes as listed at the bottom of the form.

Location - As the gear is set, the captain will record:

Latitude (N) in degrees and decimal minutes - dd°mm.mm, and

Longitude (E or W) in degrees and decimal minutes - ddd°mm.mm. All pots in this survey will be set in west longitude; circle the letter 'W' on each Pilot House Log. Latitude and longitude may be recorded in either of two ways, e.g., 52°15.77' or as a string of numbers with symbols and decimal points omitted '521577'.

-continued-

Logger ID: The temperature data logger ID number will be recorded in the same row as the sequential pot number in which it was deployed.

Lift Gear

Date: The captain will record the date the gear is pulled, in mm/dd/yy format.

Time: The captain will record the time the gear is pulled, in local Alaska time and in 24-hour format (0000 – 2359). '0000' is midnight and denotes the beginning of the next day.

Gear Performance: Gear performance will be assessed for every pot pulled. Codes to be used are at the bottom of the form.

Appendix C2.–Crab measurement form.

Crab Measurement Form

Sample Date (mm/dd/yy): _____ Recorder: _____
Station Number: _____ **Survey Code:** Measurer(s): _____
SPN: _____ Buoy ID: _____ _____ Logger ID: _____
Page_____ of _____ Tag Series: _____

	SPECIES CODE	SEX	CARAPACE SIZE (mm)	CHELA HEIGHT (mm)	LEGAL SIZE	SHELL CONDITION	FEMALE MATURITY	EGGS: CLUTCH FULLNESS	EGGS: EGG DEVEL	EGGS: CLUTCH COND	EGGS: EGG COLOR	CONDITION	PARASITES	TAG NUMBER	COMMENTS
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
21															
22															
23															
24															
25															

SPECIES CODES:
1 = golden king
2 = red king
3 = blue king
4 = hair crab
5 = hybrid, *C. bairdi x C. opilio*
6 = *C. bairdi*
7 = *C. opilio*
8 = *C. angulatus*
9 = Dungeness
10 = *L. couesi*
11 = *C. tanneri*
12 = *P. multispina*
13 = *P. verilli*
41 = hybrid, *C. bairdi*
42 = hybrid, *C. opilio*

SEX:
0 = unknown
1 = male
2 = female
3 = hermaphrodite

SHELL CONDITION:
0 = premolt/molting
1 = soft
9 = new, pliable
2 = new
3 = old
4 = very old
5 = very, very old

LEGAL SIZE:
0 = sublegal
1 = legal, retained
2 = legal, not retained

FEMALE MATURITY:
0 = unknown
1 = immature
2 = mature
3 = mature, primiparous
4 = mature, multiparous

CONDITION:
blank = uninjured
1 = fresh injury
2 = dead
3 = previously dead

EGGS

CLUTCH FULLNESS:
0 = no eggs
1 = trace to 1/8 full
2 = 1/4 full
3 = 1/5 full
4 = 3/4 full
5 = 100% full

EGG DEVELOPMENT:
1 = uneyed eggs
2 = eyed eggs
3 = hatching

CLUTCH CONDITION:
1 = no dead eggs
2 = dead eggs < 20%
3 = dead eggs > 20%
4 = barren / clean setae
5 = barren / matted setae
6 = no setae

EGG COLOR:
0 = other
1 = cream
2 = tan
3 = yellow
4 = orange
5 = dark orange
6 = pink
7 = reddish
8 = purple
9 = purple-brown
10 = brown
11 = brownish-black

PARASITES:
blank = not examined
0 = none
1 = B. callosus
2 = nemertean worms
3 = bitter crab
4 = other
5 = black mat
6 = CCB
7 = cottage cheese
8 = turbellarian worms
9 = pepper crab
10 = snailfish eggs
12 = leatherback

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-continued-

INSTRUCTIONS FOR CRAB MEASUREMENT FORM

This form is used to record selected crab species from sampled pots. At least one form will be filled out for every sequential pot number set. If a pot contains zero crab, make a large null symbol **'Ø'** on the center of the form. If multiple sexes or species are sampled on the form, a blank line will separate those changes. Enter the Survey Code and fill in the Sample Date, Station Number, Sequential Pot Number, Buoy ID, and Logger ID fields as directed in the *Survey Pilot House Log* instructions.

Sample Date: Record the date that the pot was sampled, in mm/dd/yy format.

Recorder: Write the initials of the person recording the data.

Measurer(s): Write the initials of the person(s) measuring crabs.

Page ___ of ___ : The pages of this form will be numbered sequentially within each SPN sampled. When the last page of an SPN is completed, that number will be written in the 2nd blank on all the pages. For example: A total of 4 crab measurement pages were used to record data for an SPN. 'Page 1 of 4' would be on the first page, and 'Page 4 of 4' would be on the last page.

Species Code: Record the species code of the sampled crab from the list at the bottom of the form.

Sex: Record the sex of the crab as noted at the bottom of the form.

Carapace Size (mm): Record the carapace length of king and hair crabs in mm CL. For Tanner and Dungeness, record the carapace width in mm CW.

Chela Height (mm): N/A – Not recorded during this survey.

Legal Size: Record the legal size/retention status code of male crabs only; record code **'0'** for sublegal males and code **'2'** for all legal males sampled during the survey.

Shell Condition: Record the shell condition of each crab sampled as noted at the bottom of the form.

Female Maturity: Record the maturity status of each crab sampled. Codes 3 and 4 only apply to *Chionoecetes* crabs.

Eggs – When mature female crabs are sampled, the following data fields will be completed using the codes listed at the bottom of the form.

Clutch Fullness: Ranges as fractional percentage from no eggs (0%) to 100% full.

Egg Development: Eggs will be eyed, uneyed, or hatching.

Clutch Condition: Presence of dead eggs OR presence of clean or matted setae.

Egg Color: Egg color will be the closest match to colors displayed in the standard color chart.

Condition: The crab is uninjured (***blank***), newly-injured, dead, or previously dead.

-continued-

Parasite(s): Record all codes that apply to the sampled crab. This field will be ***blank*** if a crab was not examined for parasites. Multiple parasites can be recorded, separated by commas (e.g., 1, 10).

Tag Series: N/A – Not recorded during this survey.

Tag Number: N/A – Not recorded during this survey.

Comments: Note items specific to the sampled crab e.g., severely injured, extensive bleeding, poor overall condition), and other observations not captured in required form fields.

Appendix C3.–Station catch summary forms.

BLUE KING CRAB

Station Catch Summary Form

2007 St. Matthew Island Blue King Crab Survey

PG _______ OF _______

FV _________________ ***At-sea use only - no database entry*** RECORDER _______________________

STATION	SEQUENTIAL POT NUMBER	SUBLEGAL MALES <105 (mm CL)	SUBLEGAL MALES ≥105 (mm CL)	SUBLEGAL MALES Total	LEGAL MALES New-shell <134-mm CL	LEGAL MALES All Olds & News ≥134-mm CL	LEGAL MALES Total	FEMALES Immature	FEMALES Mature	FEMALES Total	COMMENTS
STATION	TOTALS										
STATION	TOTALS										
STATION	TOTALS										
STATION	TOTALS										
STATION	TOTALS										
	TOTALS										

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-continued-

SNOW CRAB

Station Catch Summary Form

2007 St. Matthew Island Blue King Crab Survey

PG _______ OF _______

FV _________________ ***At-sea use only - no database entry*** RECORDER _______________________

STATION	SEQUENTIAL POT NUMBER	SUBLEGAL MALES	LEGAL MALES			FEMALES			COMMENTS
		<79-mm CW	79-101 mm CW	≥102-mm CW	Total	Immature	Mature	Total	
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								
STATION	TOTALS								

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-continued-

INSTRUCTIONS FOR STATION CATCH SUMMARY FORM

******At-sea use only – no database entry******

This form documents the daily catch record for male and female blue king crabs by station and sequential pot number. An identical form will be used to summarize the daily catch record for male and female snow crabs. This form is used to prepare catch information for daily e-mail transmissions to ADF&G offices, and in the preparation of the post-survey cruise memo. The cruise leader or the assistant cruise leader is solely responsible for completing this form. If subsampling of the catch has occurred, record the total counts recorded on the *Crab Subsampling Form* (see next page).

Fill in Station Number, Sequential Pot Number, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

Record the catch at each SPN for the categories listed below. Record the total catch by subgroup for each station sampled.

Blue King Crabs

Legal Males

Recruit: new-shell crabs <134-mm CL.
Postrecruit: new-shell crabs ≥ 134-mm CL.
Postrecruit: old- or very old-shell crabs of legal size.
Total number of legal males.

Sublegal Males

Sublegals < 105-mm CL.
Sublegals ≥ 105-mm CL.
Total number of sublegal males.

Females

Mature
Immature
Total number of females.

Snow Crabs

Legal Males

≥ 79-mm (3.1-in) CW.
≥ 102-mm (3.1-in) CW.
Total number of legal males.

Sublegal Males

< 79-mm (3.1-in) CW.
Total number of sublegal males.

Females

Immature
Mature
Total number of females.

Appendix C4.–Crab subsampling form**.**

Crab Subsampling Form

Sample Date (mm/dd/yy): _____ Survey Code:_____ Recorder: _____

Page_____ of _____

	SPN	STATION NUMBER	BUOY ID	SPECIES CODE	SEX	LEGAL SIZE	FEMALE MATURITY	SPECIAL CATEGORY	NUMBER NOT MEASURED	NUMBER MEASURED	TOTAL NUMBER	COMMENTS
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15												

SPECIES CODES:
1 = golden king
2 = red king
3 = blue king
4 = hair crab
5 = hybrid, *C. bairdi X C. opilio*
6 = *C. bairdi*
7 = *C. opilio*
8 = *C. angulatus*
9 = Dungeness
10 = *L. couesi*
11 = *C. tanneri*
12 = *P. multispina*
13 = *P. verilli*
41 = hybrid, *C. bairdi*
42 = hybrid, *C. opilio*

SEX:
0 = unknown
1 = male
2 = female
3 = hermaphrodite

LEGAL SIZE:
0 = sublegal
1 = legal, retained
2 = legal, not retained

FEMALE MATURITY:
0 = unknown
1 = immature
2 = mature
3 = mature, primiparous
4 = mature, multiparous

SPECIAL CATEGORY - *C. opilio* only:
1 = Sublegal males < 79-mm CW
2 = Legal males ≥ 79-mm CW
3 = Legal males 79 - 101 mm CW
4 = Legal males ≥102-mm CW
5 = Females

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-continued-

INSTRUCTIONS FOR CRAB SUBSAMPLING FORM

This form will be NOT be used when sampling blue king crabs. However, it is very likely to be used for anticipated high catches of snow crabs at some stations. It is used to record the total number of crabs that have been subsampled at each pot by separate sex and size categories determined prior to conducting the survey. Measuring of snow crabs will not commence until crab counts for each subsampling category have been made and recorded.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Buoy ID fields, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form. Record the Species Code, Sex, and Female Maturity columns as directed in the *Crab Measurement Form* instructions.

Special Category: Enter one of the five **snow crab** special category codes in the row containing the appropriate SPN and station number. The five special categories that will be used during the 2007 St. Matthew Island survey are listed below.

1 = Sublegal males < 79-mm CW

2 = Legal males ≥ 79-mm CW

3 = Legal males 79 – 101 mm CW

4 = Legal males ≥ 102-mm CW

5 = Females

Number Not Measured (i.e., crabs counted and released to the sea): Tally the number of unmeasured crabs by identified sex and size categories.

Number Measured (i.e., subsample of crabs that were measured): Tally the number of crabs measured by identified sex and size categories.

Total Number: Add the number of measured and unmeasured crabs and record the total number of crabs caught by identified sex and size categories.

Comments: Anything related to the sampling or subsampling of sex and size categories will be noted.

Appendix C5.–Species composition form**.**

Species Composition Form

Sample Date (mm/dd/yy): _____ Vessel Name: _____

Page_____ of _____ Survey Code: _____ Recorder: _____

	SPN	STATION NUMBER	BUOY ID	SPECIES NAME	SPECIES CODE (NMFS RACE)	TOTAL NUMBER	COMMENTS
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							

FREQUENTLY ENCOUNTERED SPECIES - ST. MATTHEW ISLAND

471 = Alaska skate
10120 = Pacific halibut
10210 = yellowfin sole
20510 = sablefish (black cod)
21370 = Great sculpin
21720 = Pacific cod
21740 = walleye pollock
40011 = hydroid unident.
40500 = jellyfish unident.
68577 = Circumboreal toad crab
78403 = giant octopus
80590 = knobby 6-ray seastar
80595 = Leptasterias unident.
81095 = rose sea star
81780 = common mud star
82510 = green sea urchin
83000 = brittlestar unident.
83020 = basketstar
83320 = notched brittlestar
91000 = sponge unident.
68578 = Pacific lyre crab
69010 = hermit crab unident
69086 = fuzzy hermit crab
71500 = snail unident.
71820 = Pribilof neptune
71882 = fat whelk
72743 = angled buccinum
72751 = sinuous whelk
72752 = silky buccinum
72755 = polar whelk

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-continued-

INSTRUCTIONS FOR THE SPECIES COMPOSITION FORM

This form is used to record total numbers of all identified species from sampled pots, except for the crab species documented on the *Crab Measurement Form*. If there are no species other than measured crabs in the pot, make a null symbol **'Ø'** in the Species Name column for that SPN.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, Station Number, Bouy ID, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

Species Name: Write the common name, or if unavailable, the scientific name of each animal caught.

Species Code: Except as noted below, record the 5-digit NMFS RACE code of each identified animal. Commonly-encountered species near St. Matthew Island are listed at the bottom of the form; refer to the supplied 2007 NMFS Species Code Book for additional codes. If an animal cannot be identified to species at the time of sampling, note the genus or family name and write the corresponding code on the form. When photographs or specimens are taken for later positive identification, note that in the Comments section (below).

Total Number: By species or taxon, record the total number of animals caught in each pot.

Comments: Anything related to individual species listed on the form (photograph taken, specimen collected, preliminary identification, etc.).

Appendix C6.–Fish length form**.**

Fish Length Form

Sample Date (mm/dd/yy): _____ Vessel Name: _____

Recorder: _____

Page_____ of _____ Survey Code: _____ Measurer(s): _____

	SPN	SPECIES CODE (NMFS RACE)	FISH LENGTH (cm)	SPECIES NAME	COMMENTS
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					

NMFS RACE SPECIES CODES AND FISH TO MEASURE LIST:

10110 = arrowtooth flounder
10112 = Kamchatka flounder
10115 = Greenland turbot
10210 = Pacific halibut
10130 = flathead sole
10170 = English sole
10200 = rex sole
10210 = yellowfin sole
10220 = starry flounder
10250 = sand sole
10261 = northern rock sole
10262 = southern rock sole
10270 = butter sole
10285 = Alaska plaice
20510 = sablefish
21110 = Pacific herring
21710 = Pacific tomcod
21720 = Pacific cod
21740 = walleye pollock
21910 = lingcod
21921 = Atka mackerel
30020 = shortspine thornyhead
30050 = rougheye rockfish
30060 = Pacific ocean perch
30151 = dusky rockfish
30330 = black rockfish
30400 = bocaccio
30420 = northern rockfish
30430 = redstripe rockfish
30470 = yelloweye rockfish
30475 = redbanded rockfish
30576 = shortraker rockfish

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-continued-

INSTRUCTIONS FOR FISH LENGTH FORM

This form is used to record the measurements of commercially-important or other selected fish species from sampled pots. If there are no fish species measured from the pot, make a null symbol **'Ø'** in the Species Name column for that SPN.

Enter the Sample Date, Survey Code, Vessel Name, Sequential Pot Number, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the data recorder's name and the name(s) of those who measured the fish.

Species Code: Record the 5-digit NMFS RACE code of each measured fish. Fish species to be measured are listed and coded at the bottom of the form; refer to the supplied 2007 NMFS Species Code Book for additional codes.

Fish Length (cm): Record the total length or the fork length of the fish, in centimeters.

Fork length (FL) – Distance from the anteriormost point on the head to the innermost part of the fork of the tail fin.

Total length (TL) – the greatest length of a fish from the anteriormost point on the head to the tip of the tail.

Species Name: Write the common name, or if unavailable, the scientific name of each animal caught.

Comments: Anything related to the individual fish measured. If the fish was preserved or collected for identification, document that action in the Comments section.

Appendix C7.–Data logger recording form.

Data Logger Recording Form

Sample Date (mm/dd/yy): _____ Vessel Name: _____

Page_____ of _____ Survey Code: _____ Recorder: _____

	PROBE ID	MODEL	MAXIMUM DEPLOYABLE DEPTH	SERIAL NUMBER	COMMENTS
1	219	XR-420-CTD	2,185 fm (4,000 m)	9643	
2	220	XR-420-CTD	2,185 fm (4,000 m)	9641	Lost 11/2007
3	221	XR-420-CTD	2,185 fm (4,000 m)	9616	
4	222	TDR-2050	3,280 fm (6,000 m)	11879	
5	223	TDR-2050	3,280 fm (6,000 m)	11880	
6	224	TDR-2050	1,090 fm (2,000 m)	11818	
7	225	TDR-2050	1,090 fm (2,000 m)	11808	
8	226	TR-1050	400 fm (740 m)	12570	
9	227	TR-1050	400 fm (740 m)	12569	
10	228	TR-1050	400 fm (740 m)	12176	
11	229	TDR-2050	3,280 fm (6,000 m)	11884	
12	230	TDR-2050	3,280 fm (6,000 m)	11885	
13	231	TDR-2050	3,280 fm (6,000 m)	11886	
14	232	XR-420-CTD	3,280 fm (6,000 m)	13166	
15	233	XR-420-CTD	3,280 fm (6,000 m)	13167	
16	234	XR-420-CTD	3,280 fm (6,000 m)	13168	
17	235	TR-1000	545 fm (1,000 m)	7209	
18	236	TR-1000	545 fm (1,000 m)	8429	
19					
20					

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INSTRUCTIONS FOR DATA LOGGER FORM

This form is used to identify the unique logger ID number of the units that are deployed in survey pots. Enter the Sample Date, i.e., the date that the form was filled out and the Vessel Name and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form. If additional loggers are used, record all items as detailed above.

Comments: Anything related to the performance, deployment, and especially 'not retrieved' if a pot containing a logger is lost during the survey.

-continued-

Appendix C8.–Pot type recording form.

Pot Type Recording Form

Sample Date (mm/dd/yy): _____ Vessel Name: _____

Page_____ of _____ Survey Code: _____ Recorder: _____

	SPN	BUOY ID	GEAR CODE	ESCAPE RING SIZE	NUMBER ESCAPE RINGS	ESCAPE MESH SIZE	POT TYPE	COMMENTS
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

GEAR CODE DEFINITIONS:

24 = ADF&G shellfish research 7' X 7' X 34" rectangular pot with 2.75" stretch mesh, and no escapement mechanisms

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INSTRUCTIONS FOR POT TYPE FORM

This form is used to identify crab pot sizes and types used on surveys; it can be completed prior to embarking on the survey. Enter the Sample Date, i.e., the date that the form was filled out and the Vessel Name, Survey Area, and page numbers as directed in the *Survey Pilot House Log* instructions. Record the name of the person that fills out this form.

Gear Code: ADF&G shellfish research pots, code **'24'** is the only pot type used during this survey.

In the SPN column, write 'all'. The Buoy ID, Escape Ring Size, Number of Escape Rings, Escape Mesh Size, and Pot Type fields will be blank.

Appendix C9.–QTC VIEW form.

QTC VIEW Form

Date	Time	File Name	Comments

INSTRUCTIONS FOR QTC VIEW FORM

This form is used to keep track of the data files created by the QTC VIEW. The primary purpose of form is to note any problems, ocean or weather conditions that may affect the quality of the data acquired.

Date and Time: record the current day and time the file is downloaded to the external hard drive.

File Name: record the year, month and day (yyyymmdd) corresponding to the particular data set being downloaded. The QTC VIEW automatically assigns this format to the data.

Comments: enter any relevant observations here.

-continued-

Appendix C10.–Benthic sampling form.

Benthic Sample Form

Vessel Name: _____ Survey Code: _____ Page ____ of ____

	Sample Number	Sample Date (mm/dd/yy)	Time (0000-2359)	Location			Depth (fathoms)	Comments
				Latitude (N) (dd°mm.mm)	Longitude (W) (ddd°mm.mm)	E or W		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

ADF&G SHELLFISH RESEARCH-REV JUNE 11, 2007

INSTRUCTIONS FOR BENTHIC SAMPLE FORM

This form is used to document benthic samples collected during the charter. Complete the form at the time the sample is taken. Enter the Vessel Name, Survey Code, Sample Date and Time, Location, and Depth as directed in the *Survey Pilot House Log* instructions. At the start of sample collection, ask the captain for the latitude and longitude coordinates (either he writes them down or he hails them to the deck) and depth. Sample Numbers will be unique and numbered sequentially beginning at '1'.

In the Comments section, note information pertinent to the collected sample such as current, tide, and weather conditions that may have hampered sample collection. Performance of the Van Veen grab during deployment and retrieval of the unit must also be detailed in the Comments section, including whether or not the grab landed properly and whether or not the grab was completely closed at retrieval.

Appendix C11.–Weather observation form.

Weather Observation Form

Vessel Name: _____ Survey Code: _____ Page _____ of _____

	STATION NUMBER	DATE (mm/dd/yy)	TIME (0000-2359)	CLOUD COVER	WIND		SWELL	BAROMETER (millibars)	COMMENTS
					SPEED	DIRECTION			
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
25									

CLOUD COVER:
1 = Clear
2 = 1/8 obscured
3 = 1/4 obscured
4 = 3/8 obscured
5 = 1/2 obscured
6 = 5/8 obscured
7 = 3/4 obscured
8 = 7/8 obscured
9 = Completely overcast

WIND SPEED:
0 = Calm
1 = Light air
2 = Light breeze
3 = Gentle breeze
4 = Moderate breeze
5 = Fresh breeze
6 = Strong breeze
7 = Near gale
8 = Gale
9 = Strong (or severe) gale
10 = Storm
11 = Violent storm
12 = Hurricane

SWELL:
1 = 0 .. 2 feet
2 = 2 .. 4 feet
3 = 4 .. 6 feet
4 = 6 .. 8 feet
5 = 8 .. 10 feet
6 = 10 .. 12 feet
7 = 12 .. 14 feet
8 = 14 .. 16 feet
9 = more than 16 feet

ADF&G SHELLFISH RESEARCH-Rev. June 11, 2007

INSTRUCTIONS FOR WEATHER OBSERVATION FORM

This form is used to document daily weather observations at stations fished during the charter, and will be completed at the time each station is set and picked (2 observations per station). If an observation is made at non-station locations, leave the station number blank.

Enter the Vessel Name, Survey Code, Page Number, Station Number, Date, and Time as directed in the *Survey Pilot House Log* instructions. Record the appropriate ***code*** numbers for cloud cover, wind speed (see next page for wind speed code explanations) and direction, swell, and barometer reading. In the Comments section, note any other information pertinent to the weather observation.

-continued-

Wind Speed Codes

Wind speed is a measure of wind velocity in knots and uses the Beaufort scale.

0 = Calm: Sea surface smooth and mirror-like. Wind speed approximately 0-1 knots (0-1 mph).

1 = Light Air: Ripples with the appearance of scales are formed, but without foam crests. Wind speed approximately 1-3 knots (1-3 mph).

2 = Light Breeze: Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break. Wind speed approximately 4-6 knots (4-7 mph).

3 = Gentle Breeze: Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses. Wind speed approximately 7-10 knots (8-12 mph).

4 = Moderate Breeze: Small (1-4 ft) waves becoming larger; fairly frequent white horses. Wind speed approximately 11-16 knots (13-18 mph).

5 = Fresh Breeze: Moderate (4-8 ft) waves taking a more pronounced long form; many white horses are formed. Chance of some spray. Wind speed approximately 17-21 knots (19-24 mph).

6 = Strong Breeze: Large (8-13 ft) waves begin to form; the white foam crests are more extensive everywhere. Probably some spray. Wind speed approximately 22-27 knots (25-31 mph).

7 = Near Gale: Moderately high (13-20 ft) waves and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Wind speed approximately 28-33 knots (32-38 mph).

8 = Gale: Moderately high (13-20 ft) waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind. Wind speed approximately 34-40 knots (39-46 mph).

9 = Strong (or Severe) Gale: High (20 ft) waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility. Wind speed approximately 41-47 knots (57-54 mph).

10 = Storm: Very high (20-30 ft) waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The 'tumbling' of the sea becomes heavy and shock-like. Visibility affected. Wind speed approximately 48-55 knots (55-63 mph).

11 = Violent Storm: Exceptionally high (30-45 ft) waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected. Wind speed approximately 56-63 knots (64-72 mph).

12 = Hurricane: The air is filled with foam and spray, waves over 45 ft. Sea completely white with driving spray; visibility very seriously affected. Wind speed approximately 64-71 knots (73-83 mph).

-continued-

Appendix C12.–Snow crab growth study tally form.

2007 ADF&G Snow Crab Growth Study Tally Form

Vessel:_____ Sample Collection Dates:_____ to _____

Sample goals by sex and size range indicated within each cell

CW (mm) Range	Females	CW (mm) Range	Males
< 40	15	< 50	15
40 – 45	15	50 – 60	15
45 – 50	15	60 – 70	15
50 – 55	15	70 – 80	15
55 – 60	15	80 – 90	15
> 60	15	> 90	15

-continued-

Appendix C13.–Snow crab growth data form.

Snow Crab Growth Data Form

2007 ADF&G St. Matthew Island Blue King Crab Survey

Vessel: _____ **Recorders: _____/_____/_____** **Page: _____ of _____**
(Initials)

	Date	Pot #	Tag #	Sex[a]	CW[b]	CH[b,c]	Comments
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

[a]: 1 = male; 2 = female [b]: To 0.1 mm [c]: Measure chela height of males

APPENDIX D. CRAB CODE DESCRIPTIONS

Appendix D1.-Crab code descriptions.

Many of the biological descriptions for king crabs are illustrated in Donaldson and Byersdorfer (2005) and in Jademec et al. (1999).

Crab Species Codes. Shorthand species codes (or deck codes) are recorded in on-deck survey forms.

Code	Common Name	RACE Code	Scientific Name
1	golden king crab	69310	*Lithodes aequispinus*
2	red king crab	69322	*Paralithodes camtschaticus*
3	blue king crab	69323	*Paralithodes platypus*
4	hair crab	69400	*Erimacrus isenbeckii*
5	Tanner hybrid	68590	*Chionoecetes bairdi* and *C. opilio* hybrid
6	Tanner crab	68560	*Chionoecetes bairdi*
7	snow crab	68580	*Chionoecetes opilio*
8	triangle Tanner crab	68570	*Chionoecetes angulatus*
9	Dungeness crab	68020	Cancer magister
10	scarlet king crab	69300	*Lithodes couesi*
11	grooved Tanner crab	68550	*Chionoecetes tanneri*
12	*Paralomis multispina*	69335	*Paralomis multispina*
13	*Paralomis verrilli*	69331	*Paralomis verrilli*
41	*C. bairdi hybrid*	n/a	-
42	*C. opilio hybrid*	n/a	-

Legal Size. Describes the size and fate of male crabs.

0 = Sublegal. Crab is too small to retain under any conditions.

1 = Legal, retained. A legal-sized crab that has been retained for market or study.

2 = Legal, not retained. A legal-sized crab that has been returned to the sea.

Shell Condition. Shell condition codes are used to reflect the approximate time since a crab has last molted. Scratching on the ventral surface of the coxa, legs and carapace, shell color, epifaunal growth, and spine and dactyl wearing are all indicators of elapsed time since last molt.

0 = Premolt and molting. Crab is preparing to molt, exoskeleton is beginning to decalcify and soften.

1 = Soft. Crab has recently molted, exoskeleton is very soft, flaccid, and shapeless when out of the water. Exoskeleton texture is similar to wet leather or skin.

-continued-

9 = New, pliable. Exoskeleton is firm yet flexible, few or no scratches, pits, or epibionts present. Ventral surface of the coxa is shiny, spines and dactyls are sharp.

2 = New. Coxa and ventral surface of the exoskeleton are dull, ranging from no-to-slight discoloration and no-to-limited scratching. Spines and dactyls may be slightly worn. Merus not easily compressed by pinching and will crack if bent. Adult female Tanner crabs rarely have grasping marks on the merus.

3 = Old. Characteristic exoskeleton is darker in coloration, and has significant scratching, wear, and abrasions. Carapace and chela are hard and cannot be indented by thumb pressure. Dactyls are worn and dull at the tips. Spines are worn or rounded. Barnacles and other epibionts are usually present. Adult female Tanner crabs that have been mated a second time usually show grasping marks on the merus.

4 = Very old. Distal portion of ventral coxa densely covered with dark scratching. Tips of dactyls are well worn, rounded, and dark. Carapace is frequently covered with epibionts to a greater extent than old-shell crabs. Adult female Tanner crabs that have been mated more than two times frequently have multiple grasping marks on the merus.

5 = Very, very old ('graveyard'). Exoskeleton characterized by being soft and spongy because of decay. Spines and dactyls are heavily worn and often worn through to muscle. Epibionts are always present and the shell appears brown to black dorsally and ventrally. Crabs of this shell age are usually listless upon capture.

Female Maturity. Maturity describes the relative reproductive stage of the animal.

0 = Unknown. The maturity of the crab was not determined.

1 = Immature. Juvenile animal too young to reproduce.

2 = Mature. Adult animal old enough to reproduce.

3 = Mature, primiparous. New-shell adult female crab, without grasping marks, developing or having previously developed a single clutch.

4 = Mature, multiparous. Old, very old, or very, very old shell adult female crab, with one or more grasping marks, that has developed at least two clutches.

Eggs. Descriptions of the egg clutch or pleopodal setae.

Clutch Fullness. Describes the fractional amount of eggs present in relationship to the size of the abdomen; fullness is recorded as a visual estimation of the size of the clutch relative to an idealized full clutch (100%).

0 = No eggs present.

1 = Trace to $1/8^{th}$ full. From 1 egg up to 1/8 of a full clutch; eggs not visible when the abdomen is closed.

2 = 1/4 full. Up to 1/4 (13% - 25%) of a full clutch; eggs not visible when the abdomen is closed.

3 = 1/2 full. Up to 1/2 (26% - 50%) of a full clutch; eggs just visible when the abdomen is closed.

-continued-

4 = 3/4 full. Up to 3/4 (51% - 75%) of a full clutch; eggs are visible when the abdomen is closed.

5 = Full. A completely full clutch (76% - 100%); thickness of the egg mass is greatly pronounced.

Egg Development. Describes the observed stage of egg maturity. Eye slits or eye spots are visible as the egg develops. If empty egg cases are visible among viable eggs within the clutch, the eggs are in the hatching state. *For golden king crabs, newly-hatched zoeae may be visible to the naked eye.*

1 = Uneyed. Unfertilized or early development stage eggs with no visible eye spots.

2 = Eyed. Eye spots and/or prezoeae visible in eggs.

3 = Hatching. Eggs are clearly in a visible state of hatching; empty egg cases are present.

Clutch Condition. Describes the general overall condition of the clutch, setae, and eggs observed during the examination of mature female crabs.

1 = No dead eggs. Eggs are present but none are visibly dead.

2 = Dead eggs (< 20%). Less than 20% of the visible eggs are dead; dead eggs appear opaque or off-color from the remainder of the clutch.

3 = Dead eggs (> 20%). More than 20% of the visible eggs are dead.

4 = Barren, clean setae. No visible eggs, pleopodal setae are clean, shiny, light in color and very fine.

5 = Barren, matted setae. No visible eggs, pleopodal setae are dirty in appearance and often have dead and/or empty egg cases attached.

6 = No visible setae on pleopods.

Egg Color. Use the *standard color chart* illustrations to match egg color.

0 = other; describe.	**4** = orange	**8** = purple
1 = cream	**5** = dark orange	**9** = purple-brown
2 = tan	**6** = pink	**10** = brown
3 = yellow	**7** = reddish	**11** = brownish-black

Condition. Describes the apparent health of the animal.

0 = Uninjured. No visible fresh injuries.

1 = Fresh injury. The animal has been injured during/after gear retrieval.

2 = Dead. The animal died during/after gear retrieval.

3 = Previously dead. The animal died prior to gear retrieval.

Parasites and Diseases. Common parasites and diseases that have been observed during the course of routine field work are listed below. *Parasite and disease data is anecdotal unless otherwise noted (e.g., for special projects).*

0 = None. Animal was examined; no parasite or disease observed.

1 = *Briarosaccus callosus* externae or scars from previous externae present within abdominal flap.

-continued-

2 = Nemertean worms present in egg clutch.

3 = Bitter crab. Crab afflicted with bitter crab syndrome.

4 = Other. Note the presence of a parasite or disease not described in this list.

5 = Black mat. Crab afflicted with black mat syndrome.

6 = CCB. Chitinoclastic bacteria presence evident on crab shell.

7 = Cottage cheese. Crab afflicted with 'cottage cheese' disease.

8 = Turbellarian worms present in egg clutch.

9 = Pepper crab. Crab afflicted with pepper crab disease.

10 = Snailfish eggs. Snailfish eggs present under the carapace within the branchial chamber.

12 = Leatherback. A crab with a leathery or rubbery carapace, regardless of shell condition.

APPENDIX E. SURVEY EQUIPMENT LIST

Appendix E1.-Survey equipment list.

EQUIPMENT PROVIDED FOR EACH ADF&G CREWMEMBER

1. Immersion suit with new 406 EPIRB and FireFly3 strobe
2. Rain gear, boots, gloves (6 pairs liners and 6 pairs rubber per person)
3. SOSpenders (approved Type V for use as a Type II)
4. TakTikka LED headlamps

DECK AND SAMPLING EQUIPMENT

1. One 4'x8' aluminum sorting table with 6 stands
2. (12) thin, 3" hex head bolts and appropriate sized socket wrench for table assembly
3. (4) regular size clipboards (plastic or non-gunked up regular)
4. (5) covered clipboards (aluminum or plastic)
5. (6) pair calipers, large size with millimeter scale
6. Measuring sticks: (**4**) 5.5" for blue king and Tanner crabs; (**4**) 3.1" for snow crabs.
7. (3) tape measures (cm) for fish measurements
8. (6) onion sacks for holding crabs, fish in tanks
9. (1) fish measuring board
10. (1) can WD-40
11. (4) dump totes
12. (25) fish baskets
13. (4) plastic Rubbermaid dishpans
14. Assorted plastic bags: (2 doz.) gallon and (100) quart zip-locks; (2 doz.) 25 gal. clear thick mil
15. (10) rolls electric tape
16. (1) liter of 100% formalin, with mixing jar
17. (1) gallon alcohol
18. (20) specimen jars
19. (1) dissecting kit
20. (12) Victorinox knives
21. (2) plastic toolbox for crab sampling equipment
22. (2) magnifying glasses, including (1) 4-inch diameter
23. safety mats, to stand on while sampling
24. (1) Van Veen grab sampler

FISHING/POT REFURBISHING SUPPLIES

1. (2) 5-lb rolls #30 biodegradable cotton twine
2. (7) 5-lb rolls #96 tarred seine twine
3. (5) 5-lb rolls #84 tarred seine twine
4. (12) 5-lb rolls 5-mm orange poly twine
5. (1) 600-ft roll #32 groundline, for door ties
6. (50) metal door hooks
7. (50) door rubbers
8. (4) net mending needles, assorted sizes
9. (2) hand-held propane torches

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10. (2) propane cylinders
11. (90) research king crab pots with bridles attached
12. (90) buoy lines with attached buoys

FORMS

1. 60 Survey Pilot House Log forms
2. 4,000 Crab Measurement forms (rite-in-rain) **check on use of old forms**
3. 80 Station Catch Summary forms (2 sets, one for blue king crab, 1 for snow crab) ***non-data entry***
4. 100 Crab Subsampling forms (rite-in-rain) **check on use of old forms**
5. 400 Species Composition forms (350 rite-in-rain; 50 regular paper) **check on use of old forms**

FORMS (con't)

6. 250 Fish Length forms (rite-in-rain paper) **check on use of old forms**
7. 2 Temperature Logger ID forms (rite-in-rain paper)
8. 2 Pot Type forms
9. 10 QTC VIEW forms
10. 10 Benthic Sampling forms (rite-in-rain paper)
11. 20 Weather Observation forms
12. 3 Snow Crab Growth Study Tally forms (rite-in-rain paper)
13. 10 Snow crab Growth Data forms (rite-in-rain paper)
14. 10 sheets specimen labels (rite-in-rain paper)

CHARTS AND BOOKS

1. 2007 NMFS Species Codebook (2; Watson/Burt)
2. 2006/2008 Commercial Shellfish Fishing Regulations (1; Dutch Harbor)
3. Ranked mean species CPUE-2006 NMFS eastern Bering Sea survey, M. Wilkins, NMFS (1, Watson)
4. Checklist of Alaskan Crabs, B.G. Stevens 2002 (1)
5. Review of the Family Lithodidae, Zaklan 2002 (1)
6. Biological Field Techniques for Chionoecetes Crabs, Jadamec et al. 1999 (2)
7. Biological Field Techniques for Lithodid Crabs, Donaldson and Byersdorfer 2005 (2)
8. Alaska Saltwater Fishes and Other Sea Life, Kessler 1985 (2)
9. Guide to the Identification of some common eastern Bering Sea Snails, MacIntosh 1976 (2)
10. Common fish and inverts near Pribilof Islands - Byersdorfer 2004 (1)
11. Common fish and inverts near St. Matthew Island - Byersdorfer 2005 (1)
12. Field Guide to the Benthic Marine Invertebrates of Alaska's shelf and upper slope, Roger N. Clark, 2006 version, CD only. Copies to Watson, Burt, Byersdorfer, Gish, Renfro, Salmon, and Alinsunurin.
13. Illustrated Key to west North American Pelecypod genera, Keen & Frizzel 1946 and Illustrated Key to west North American Gastropod genera, Keen & Pearson 1952 (1)
14. Names of Decapod Crustaceans AFS #17, Williams et al. 1989 (1)

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15. Names of Mollusks AFS #16, Turgeon et al. 1988 (1)
16. Fishes of Alaska, Mecklenburg et al. 2002 (1)
17. Guide to northeast Pacific Flatfishes, Kramer et al. 1995 (1)
18. Guide to northeast Pacific Rockfishes - 2003 edition, Kramer & O'Connell 1986 (1)
19. A Field Guide to Alaskan Corals, Wing and Barnard 2004 (2)
20. Guide to Marine Mammals of Alaska, Wynne 1993(1)
21. Field guide to skates of Alaska - Version 2004.1, Duane.Stevenson@noaa.gov
22. Under Alaskan Seas, Barr and Barr 1983 (1)
23. A Field Guide to the Birds of North America, National Geographic – 4th edition 2002 (1)
24. Laminated color chart, ADF&G Shellfish Research 2006 (2)
25. Pacific Coast Crabs and Shrimps, Jensen 1995 (1)

OFFICE AND MISC. SUPPLIES

1. (2) cruise leader notebooks (L. Watson)
2. Cruise leader ADF&G collecting permit (L. Watson)
3. (1) small 3-ring binder for completed Pilot House Log forms
4. (1) small 3-ring binder for completed Station Catch Summary forms
5. (2) calculators
6. (20) mechanical pencils
7. Pkg. 'No. 2' regular pencils
8. (5) ink pens
9. Permanent markers
10. (100) sheets plain paper
11. (50) sheets Rite-in-the-Rain paper

OFFICE AND MISC. SUPPLIES (con't)

12. (20) pairs earplugs
13. 3-ring hole punch
14. Ass't. rubber bands (including large, for clipboards)
15. Ass't. rubber bands (including large, for clipboards)
16. (1) roll Scotch tape; (2) rolls duct tape
17. Ass't. paper and binder clips
18. (15) envelopes (data form filing)
19. North Star medical kit (inventoried and resupplied 6/30/2007)
20. (1) 25-ft extension cord

COMPUTERS

1. laptop, with case (2)
2. power cord (2)
3. mouse and mouse pad, if desired (2)
4. external keyboard, if desired (2)
5. Burnable CD-R (6)
6. Buss bar (2)

-continued-

CAMERAS

1. Olympus E-10 (digital)
2. batteries and charger
3. memory cards
4. Pelican case

TEMPERATURE LOGGERS

1. 10 Brancker units:
   - Five XR-420-CTDs

   XR-420-CTD (S/N 9616)
   XR-420-CTD (S/N 9643)
   XR-420-CTD (S/N 13166)
   XR-420-CTD (S/N 13167)
   XR-420-CTD (S/N 13168)
   - Five TDR-2051 or 2051TI

   TDR-2051 (S/N 11808)
   TDR-2051 (S/N 11818)
   TDR-2050Ti (S/N 11884)
   TDR-2050Ti (S/N 11885)
   TDR-2050Ti (S/N 11886)
2. RBR Submersible Data Logger User's Manual – 1/2006 edition
3. RBR software CD version 5.21, RS232 cable, and maintenance kit (lube, 'O'-rings
4. Hydraulic hose sleeves and steel attachment hardware (shackles, bolts, carabineers)
5. door hooks and rubbers for securing probes inside pots
6. 3-volt batteries; XR-420-CTDs require X; TDR-2050/2051 require X

QTC Equipment

1. QTC VIEW hardware, the 'blue box', with cable for attachment to the ship's echo sounder
2. QTC IMPACT software
3. Dedicated laptop for software installation and daily downloads from the blue box
4. digital global positioning system (DGPS) with wide area augmentation system (WASS)
5. ship's echo sounder retrofitted by Harris Electric with cable from the blue box